THE

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H. ALABASTER, GATEHOUSE & CO.,

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MINING MATTERS.

A WEEK or two ago we expressed a doubt as to the true interpretation of the clause in the New Mines Bill, which passed through Committee in the House of Lords on Wednesday, December 13th, restricting the use of electricity in mines. In the House of Lords the *Times* reports that "On the motion of Lord Emmott, it was also agreed to substitute for the original Sub.-sec. (2) of Clause 39, the following :—(2) If at any time in any place in the mine the percentage of inflammable gas in the general body of the air in that place is found to exceed one and a quarter, the electric current shall at once be cut off from all cables and other electrical apparatus in that place, and shall not be switched on again so long as the percentage of inflammable gas exceeds that amount." We cannot from this see any *actual prohibition*, *i.e.*, any definite instructions that electricity shall not be taken into the mine, or in case the percentage of gas shall be found to exceed $1\frac{1}{4}$, any instructions that electricity shall be taken out. By electricity we mean electrical plant, and we take it that electrical plant can be installed and worked in any place of a mine so long as it is *not worked* if the percentage of gas exceeds $1\frac{1}{4}$, and the current is cut off by means of a switch on the "out-bye" side of such place. If this is so, we may congratulate those most interested in the application of electricity in mines, that the measure has not proved to be so drastic as was anticipated, and it now remains to be seen whether our colliery managers are sufficiently courageous to stick to their best friend and try to arrange matters so that the percentage of gas shall not exceed $1\frac{1}{4}$, or that the machinery shall be stopped and the current cut off until it clears. But how is the $1\frac{1}{4}$ per cent. to be measured? And what is the true meaning of "inflammable gas?" Is it coal gas or fire-damp?

By the time this issue is in the hands of our readers, the momentous meeting of the Miners' Federation of Great Britain will be over, and their decision to strike or not to strike—provided they do not again postpone, which is possible—will be known. At the time of writing it is difficult to forecast what may happen, as during the interval between their meeting in November and this one, local meetings of owners and men have taken place, but in all cases, as was to be expected, the owners have refused to consider the suggestions, and at the moment the prospects are anything but bright; although the meeting between the coal-owners' and miners' representatives in the federated areas on Monday last agreed to refer the question of abnormal places back again to the local centres for further consideration, there are still the disaffected areas of Northumberland, Durham, and South Wales to be reckoned with. The Northumberland Coal-Owners' Association, for

instance, sent the following reply after a conference with the Miners' Association: "While the coal-owners are, *as they have always been*, fully prepared to consider any application for an arrangement in respect to payment for places which are abnormal and machinery for settlement of such questions, they cannot agree to the proposal that there should be an individual minimum wage for every one working in the mines, irrespective of ability or disposition to earn such wages." Nothing can be clearer to anyone gifted with ordinary common sense than that the owners could not possibly give any other reply. They might just as well hand over their collieries to the miners and apply all their available capital to the importation of coal from countries where the coal industry is not saddled with grandmotherly legislation, because, if they did not, there would be plenty of merchants ready to try the experiment.

We are convinced, however, that the men's leaders do not take the same optimistic view of a national strike as the men themselves, and were it not for the many Socialistic foolish agitators amongst the latter, we think there would be little chance of such a strike; consequently, the meeting on the 20th inst. will really be a fight between common-sense men with good jobs, and agitators who would like to have them. The former know the strike is helpless to obtain the desired result, while the latter do not care, and will be only too ready to blame the first when the débâcle arrives. The last issue of the *Colliery Guardian* contains an interesting criticism on the effect of this Act upon wages during the year 1910, and points out that "it is easy to discern a simple sequence from cause to effect," the cause being the fact that the Act had decreased the coal-getting capacity of each individual miner on the average by 4·8 per cent., resulting, as miners were paid by piece-work, in a similar reduction in the wages earned by the men; and the effect being the present agitation for a minimum wage. The decline in efficiency was not due to any shrinkage in trade, as more coals were produced, but to the fact that more men were employed to get them. Thus in 1908 the average output per head of those employed in mines was 346 tons; in 1909, 340 tons; and in 1910 it had fallen to 328 tons; while the number of persons employed in 1908 was 987,813; in 1909, 1,013,998; and in 1910, 1,049,407; or practically 62,000 more persons were employed in 1910 than in 1908, while the coal produced in 1910 only exceeded that of 1908 by 1 per cent. Hence, while the turnover has not increased, wages have had to be paid to 1,049,407 workmen instead of 987,813. Thus, as the *Colliery Guardian* puts it, "There have been more mouths to feed, and there has been no expansion in income. The immediate result can only be lower wages; the ultimate result an increase in the price of coal. The present trouble in the mining world is purely due to an attempt on the part of the workmen to force the pace and to compel the employers to raise their prices in advance of the market." We agree with this entirely, and the position now is really this: that should this country be plunged into the turmoil of a national coal strike, the Government can only blame themselves for it; and were it not for the suffering of innocent people which would be inseparable from a national strike, we could almost welcome it, for nothing else would administer such a well-deserved lesson to the Government and the miners that the economic laws cannot with impunity be interfered with at the bidding of labour leaders any more than King Canute could command the waves to retire.

Misrepresentation in Trade.

For Truth one has to look in the well, and it is not reasonable to expect to find her on an advertisement hoarding. It is natural, inevitable, and even desirable, that each manufacturer should declare his production to be the best, and thoroughly believe it to be so. They cannot all be the best, and, therefore, 99 per cent. of them must be lying, but that hurts nobody, because they know that everybody knows that they are lying, and no harm is done.

But there is a more explicit form of statement which is not so harmless, and that is a false description of the goods; and it is this evil to which a very able and interesting Report of a Special Committee of the London Chamber of Commerce is addressed. The Committee deplores the growing tendency to misrepresentation, and gives many instances, some of which bear closely on the electrical and engineering trades. We pass over the description of wine as "port" which has never seen Oporto. Such luxuries are not for engineers. But if we buy Demerara sugar we don't wish to have beet; we would certainly like our Scotch tweeds to come from Scotland; we would like wool on our backs and not a mixture. We prefer our shoes to be hand-sewn, when so marked and priced, and that the paper on which we draw should be of the quality specified and paid for.

One of the main features of the Report is the recommendation that a department should be created to put in force the various Acts of Parliament dealing with this evil; and the splendid work done by the Irish Agricultural Department is cited. We have no hesitation in saying that the stamping out of false descriptions by vendors of butter and other commodities has had an immense effect in promoting a revival of prosperity in Ireland.

Another recommendation is that all vendors of goods should be compelled by law to furnish the correct description of such goods if requested by the purchaser, and that steps should be taken to bring all nations into line on the subject so as to promote fair international trading.

The appendices are no less valuable than the body of the Report, and give specific instances of false description, for various trades, and particulars of the existing laws at home and abroad.

The question of electric lamps is the one which bears most directly on our trade, and important evidence by Mr. Leon Gaster is quoted. The marking of the assumed voltage and the candle-power, or the current consumed, upon the lamp, is frequently a misrepresentation of a very serious character. Some lamps supplied to a specification, when tested by Mr. Gaster, were found to have a life from 40 to 70 per cent. short of that specified. He also drew attention to the quantities of lamps sold without any markings at all. He urged the adoption of some form of "hall mark" for lamps, and the establishment of some authority to see that it is genuine, in the interest of the honest trader as well as that of the user; with all of which we most cordially agree.

Labour and Rates in German Cities.

It was mentioned in the recent annual report of the A.E.G. that consideration was being given to the question as to whether the Frankfort workshops of the former Lahmeyer works should not be utilised to a greater extent than is the case at present. The A.E.G. now points out that a decision in the matter is rendered difficult owing to reflections which have arisen as a result of nine months' working in Frankfort. A variety of circumstances cause manufacturing in that town to be more unfavourable than in Berlin, where the superiority of certain classes of workmen is undisputed and where production is more economical, despite the higher wages. In addition, the rates and taxes in Frankfort are 50 per cent. greater than in Berlin. The A.E.G. states that on this occasion it may remain undecided whether the complaints of the former Lahmeyer works, that the town did not always manifest towards them the goodwill which a local undertaking could claim, were justified. These considerations, taken in conjunction with the advantage of uniform manufacture in Berlin, where the company is considerately met by the city authorities, lead to the result that the A.E.G. can only resolve to separate its departments for special reasons. If the company is to take full advantage of the present position of trade, it is urgently necessary for extensions to be made more quickly than by the erection of new buildings. From this point of view, conferences have recently taken place with authoritative persons in Frankfort, which show that the town is prepared to exhibit goodwill towards the undertaking. So long as this feeling exists, the A.E.G. has nothing to gain by giving up the Frankfort works. It is added that, in addition to the present departments, which chiefly serve for the construction of machinery, the company will presumably begin the manufacture of machines and apparatus for wireless telegraphy, projectors, signalling apparatus and screws, which is already carried on in Berlin on a large scale.

The German Installation Monopoly.

A further official step in connection with the alleged German monopoly of installation work and materials, motors and accessories, against which the Prussian Government issued an order to local authorities in August, 1910, and the Baden Government last March, has now been taken by the Imperial Ministry of Alsace-Lorraine. The object in view, it will be remembered, is to prevent the establishment by any firm of a monopoly of work to be carried out on the premises of intending customers of overland central stations or stations which furnish a supply to a considerable number of small localities distributed over an extensive area. The Alsace-Lorraine Ministry has issued instructions for the guidance of the supervising authorities in forming an opinion of the contracts proposed to be concluded between the local authorities and the firms who establish overland stations, and they deal in detail with the rights and obligations of these firms. In particular, the instructions discuss the question of the right to use the roads, which can only be granted in Alsace-Lorraine under the reserve of revocation on the grounds of public interest; the obligation to supply current, the price of supply, the measurement of electrical energy, the carrying out of house installations, the duration of the agreement, and the acquisition of the station by the communal authorities. It is provided that consent must be refused under any circumstances to contract conditions whereby the firm claims for itself, or for another firm to be designated by it, the exclusive right to carry out house installations or to supply the materials, including motors. The instructions further make provision for preventing the evasion of this condition in a roundabout way.

The I.E.E.

Since the recent eruption arising out of the proposed revision of the Institution Articles, there have been many signs of a more democratic *régime* at the I.E.E., and none more noticeable or welcome than the Presidential accessibility which secured to us the continuance of the valuable discussion on Electrical Tariffs, which was inaugurated at the last meeting.

Unfortunately, much of the good resulting from a business-like procedure at the meetings may be nullified by the verbose speaker who thoughtlessly, or heedlessly, ignores the Presidential ruling as to the time available for speaking.

At the last meeting of the Institution one member, who should have known better, transgressed, occupying over 20 minutes while he imparted information which might be expected to be common knowledge to the majority of his hearers, seeing that he himself read a paper on the subject but a few years ago before the Institution.

It would be interesting to know whether this gentleman spoke as consulting engineer to the company which has adopted his proposals in practice, or as a prominent promoter of the recently formed Consulting Engineers' Association, which is supposed to hold such rigid views on professional conduct and self-advertisement; but in whatever capacity, there would be no excuse for wanton disregard of the well-known rules of debate at the I.E.E. It is evident that some drastic method of warning those who ignore the Chair and the feelings of their fellow-members is required, but nothing less than a red lamp and a fire-alarm gong will impress some people.

It is satisfactory to note, from the remarks of Mr. Ferranti at the annual dinner of the Glasgow Local Section, that there is every likelihood that the new edition of the Articles of Association will provide for voting by proxy in some form or other, thus enabling the provincial members to exercise their right to share in the government of the Institution. The question of subscriptions is less easily settled; there appears to be a satisfactory consensus of opinion to the effect that an increase is necessary, but as to the amount and proper incidence of the increase there is a strong division of opinion. Probably the outcome of the matter will be a moderate differentiation between the members in the Metropolitan area and the provincial members.

The Electrical Industry in the U.S.A. during 1909.

The preliminary report of the Department of Commerce and Labour on the output of Electrical Machinery and Apparatus, by the Census Bureau, Washington, is in the form of a review of the various divisions, with the value of the output in each. A comparative table is given, showing similar statistics for the years 1904 and 1899. In dynamos, the numbers have increased by one-half over those of 1899, and by about 7 per cent. over 1904. The value, however, has increased from £2,094,000 (1899) to £2,616,000 only, from which is deduced that, although the size of the unit has increased the price per kilowatt output has fallen. Motors have increased in value from £3,901,000 to £6,417,000, and in numbers from 159,780 to 504,730. The average capacity has declined (power motors), being 6·7 H.P., against 14·5 in 1899. Automobile motors, though 1,000 more numerous than in 1904, are slightly under the figure for 1899 (3,017). Railway motors, including motors for elevators and miscellaneous services, except fans, including also supplies and parts, are more than double in number what they were in 1899, though only showing an increase of 3 per cent. on the then value.

Storage batteries were not separately scheduled in 1899, but the weight of plates, in pounds, was 16·1 millions in 1904, and 23·1 millions in 1909. The value was £512,000 in 1899, and £935,600 in 1909, the intermediate census (1904) showing £529,000 of value.

Primary batteries were 2·6 millions in number in 1899, and 34·3 millions in 1909, or about 12 times as many. The value rose from £200,000 to £1,200,000, or only six times as much.

Arc lamps have fallen off both in number and value since 1899, though the quantity was up in 1904. The value per lamp, owing to the introduction of flame arcs, has increased.

Carbon and metallic-filament lamps are given together; these would be of considerable interest if reported separately, although, of course, prior to the present census, the output was comparatively small. The figures are:—1899, £688,000; 1904, £1,261,000; and 1909, £2,767,800, of which metallic-filaments stand for £1,536,400. All other varieties of lamps (including decorative and miniature, X-ray bulbs, vacuum tubes and vapour lamps, &c.) are valued at £663,400.

The figures for telegraph apparatus, for the three censuses, are £328,400, £222,200 and £391,400. Telephone apparatus appears at £2,102,200, £3,172,800 and £3,109,400, a slight decrease over the last five years.

Insulated wires and cables, a very important section, showed 4·25 million pounds in value for 1899, 6·9 for 1904, and 10·06 for 1909. Bare wires do not seem to have been classified separately, nor is it very apparent under which heading they are included.

Heating, cooking and welding apparatus is down for £200,600, as against £79,200 for 1904.

Magneto-ignition apparatus, spark-coils, &c., have increased considerably in value, probably owing to the automobile business, being now £1,216,000, against £135,600 in 1904.

The number of establishments engaged wholly, or (about 10 per cent.) partially in the industry was 581 in 1899, 912 in 1904, and 1,255 in 1909. The total values of outputs were:—1899, 21·16 million pounds; 1904, 31·91 million pounds; 1909, 48·79 million pounds.

THE PRESERVATION OF TELEGRAPH POLES.

[COMMUNICATED.]

Anyone taking a long railway journey through England cannot fail to note that the telegraph poles on railway slopes consist almost entirely of creosoted timber. The rare exceptions to this rule may be found at important station platforms and when the amenities of the locality would be interfered with by the presence of creosoted poles. In these special circumstances square standards of pitch pine timber are usually employed. Periodical painting is, of course, resorted to, as it preserves the wood and also renders the telegraph route less unsightly than would otherwise be the case.

Experience has shown, however, that the resinous properties of pitch pine are insufficient to prevent moisture traversing the fibre of the timber in the soil; consequently, under the influence of the warmer atmosphere above ground, disintegration sets in about the wind and water line, and after 12 years have elapsed the pole needs renewing.

Several instances could be given of wet rot having completed its destructive work at an earlier period than that specified, but the converse is equally true—indeed, some poles appear to be possessed of abnormal vitality, and for these reasons no reliable conclusion can be drawn. Perhaps the best result is obtained when the butt of a standard is charred over a slow fire and afterwards scraped and tarred prior to its erection in a sub-soil of dry sea sand.

Instead of continuing the use of pitch pine standards at tunnel ends and at the termination of underground routes, it is current British practice to install round creosoted poles of Baltic pine. The durability of these latter in murky surroundings is truly remarkable.

If it be urged that troughing for the reception of covered leading-in wires cannot be accommodated so easily on round as on square poles, but the difficulty is surely more apparent than real. Troughing ought not to be screwed directly to a round pole. Commencing from the cap downward, small pieces of 1-in. timber should be interposed and spaced about 18 in. apart. The lidding can then be easily tied in position by means of copper binders; but, what is of more importance, the arrangement ensures a free circulation of air round the troughing.

Incipient faults in covered wires are of comparatively rare occurrence, and are difficult of detection; but their number can be reduced to a minimum by boring a hole underneath the troughing where the covered wires leave the pole to enter the signal box or terminal station.

The object of the perforation is to afford an outlet for any moisture that may have percolated to the interior owing to the development of a joinering defect.

In the session of 1873-4 a paper on "The Preservation of Telegraph Poles" was read before the I.E.E., in which the various processes for the preservation of timber was discussed. Of the several methods there referred to—viz., boncherising, burnettising, kyanising, &c.—the creosoting process was most favoured.

Curiously enough the same subject came up for consideration before the I.E.E. in May, 1907. Mr. W. C. Wade, with the aid of Prof. Goodman, of Leeds, succeeded by means of an extended number of tests and experiments, in clearing away much uncertainty in relation to the subject. Among other things the paper showed unmistakably the suitability of creosoted poles for aerial transmission. It is therefore a compliment to the prevision of those early telegraph engineers who, though tempted to experiments with various local applications at the ground line of poles to prevent decay from setting in or to arrest it when once commenced, preferred using creosoted timber wherever and whenever possible. A few of these poles reduced in height are still rendering reliable service on obscure branch lines, and may be distinguished from their younger *confrères* by a roughly chiselled date mark—1870, inscribed 10 ft. from the base.

The fact may be worth recalling that poles are preserved from rot by seasoning, *e.g.*, drying out the sap under natural conditions unfavourable to fermentation. This is accomplished by stacking them in well ventilated shelters, thus protecting them from the fierce heat of summer or the snows of winter whilst exposing them to free currents of air. In due course they are ready for antiseptic treatment, and creosoting is the process that gives the most favourable results. Creosote, it may be remembered, is one of the numerous products of coal tar, and is obtained from it by distillation.

An interesting sketch (fig. 1) is given of a cylindrical creosoting tank, into which a trolley full of seasoned tele-

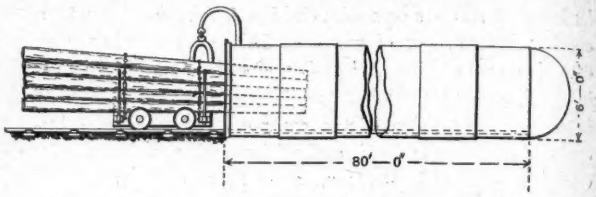


Fig. 1.—Cylindrical Creosoting Tank with Telegraph Poles to be Treated.

graph poles is being drawn. As soon as these are wholly enclosed and the cylinder end is securely fastened, the air is carefully exhausted and creosote is allowed to enter. It is forced into the timber at a pressure varying according to local circumstances and for a sufficient length of time to ensure the destruction of the germs of vegetable life. On completion of the process briefly described, the pores of the wood are filled with an oily substance which effectually checks the entrance of air and moisture, and the consequent growth of germs. The creosote is thereafter, withdrawn from the tank, the cylinder end is re-opened, and the loaded trolley removed.

Newly creosoted timber should be stored in the open air at least six months prior to its leaving the supply depôt. The importance of this detail is frequently overlooked, with the result that poles, dripping with creosote oil, are sometimes consigned by rail, and when the unskilled labourer proceeds to liberate the wagons at their destination, he incurs serious risk of slipping over the oily surface of the poles. More than one case is on record of a workman having dislocated his ankle from this cause. The clothing of construction gangmen also becomes unduly impregnated with creosote oil unless a reasonable time has been allowed to elapse before the poles are erected.

"Claims for compensation," says the postal engineer-in-chief, "have in several instances been put forward in respect of the pollution by creosote of watercress beds, ponds at which cattle drink, and well water, and substantial damages have been paid. It is, therefore, very desirable to avoid erecting creosoted poles in positions where there is danger of such contamination." In the construction of aerial telegraphs along railway cuttings, ponds, and watercress beds

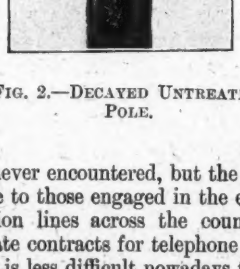


Fig. 2.—Decayed Untreated Pole.

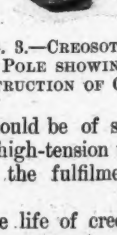


Fig. 3.—Creosoted Pole showing Destruction of Core.

are never encountered, but the warning should be of special value to those engaged in the erection of high-tension transmission lines across the country, or in the fulfilment of private contracts for telephone pole lines.

It is less difficult nowadays to assign the life of creosoted timber than was formerly the case. The reason is not far to seek. Practically every pole that has needed replacement during the past six years had previously undergone the treatment illustrated in fig. 1; hence, a wide experience has been obtained by engineers engaged upon ordinary renewal

within the period named. The writer has had occasion to take down a large number of useless creosoted poles dated 1873-4, and sell them for firewood; a lesser quantity dated 1880 has been relegated to a similar fate, but in no instance has a creosoted pole required changing because of internal decay which bears a later date-mark than 1882. It would seem, therefore, that 30 years represents the average life of a creosoted pole.

The remarkable difference between a pole of the latter type and one that has been erected without being impregnated with creosote oil, is depicted in the accompanying views (figs. 2 and 3). With respect to the uncreosoted pole (fig. 2), decay had commenced at the ground-line and spread upward after an exposure of seven years.

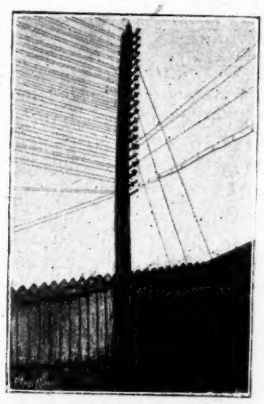


Fig. 4.—Creosoted Terminal Pole Replacing Pitch Pine Standard.

As regards fig. 3, two sections of the same cresoted pole show the destruction of the heart core from the cap downward. Wet rot had commenced where the pole was notched for the reception of arms and arm-bolts. Though decay had penetrated the interior, it will be noticed that the exterior appears impervious to moisture. After the lapse of three decades it will generally be found that a creosoted pole is soundest at and about the ground line.

From the foregoing observations, it may be conceded that a creosoted telegraph pole will continue to render efficient service until structural alterations call for its renewal.

ELECTRIC HEATING.

By PERCY GOOD.

Most people who ask for a heater for their house will say that they like their rooms warm. If they are questioned they will say that they mean the air in the room. It is doubtful if this really expresses their desire, but whatever it is, a most varied looking assortment of heaters could be seen at the Electrical Exhibition. In spite of the apparent variety they can all be conveniently classified as radiators or convectors. It is not suggested that the former do not heat that air at all by convection, or that the latter do not send out heat radiations. The classification is, in spite of that, sufficiently accurate.

All bodies radiate heat, but if everything in the neighbourhood is at the same temperature the absortion of heat is exactly equal to the radiation. If they are not at the same temperature, then the colder body absorbs more heat than it radiates, and the hotter body radiates more heat than it absorbs. This process continues until they are all at the same temperature. The rapidity with which this transference takes place depends on the difference in temperature and, to some extent, on the actual temperature, and on the surfaces of the bodies. Heat is radiated very slowly from a polished metal surface; it must therefore be absorbed very slowly by such a surface. Heat radiations behave very much like light; the usual laws for light, including the law of inverse squares, are true. That is to say, from a given source, the amount of radiation which reaches you varies inversely as the square of the distance between you and the source.

It should be noted that, whilst glass transmits about 50 per cent. of the radiation from a source of heat at a high temperature, it is almost opaque to radiation from a body below red heat.

Present-day radiators can be divided into two classes—those which have, and those which do not have, a combustible resistance. The former are usually called lamp radiators, and the latter, red-hot heaters.

Convectors consist of a resistance suspended in air, usually in a protecting case, through which air can pass freely. Some of these resistances are designed to reach a dull red heat, but generally they are so much enclosed as to be very little different in effect from those which do not get quite so hot.

Convectors can be easily made from a resistance net and a metal case, the whole costing less than the lamps or resistance in a radiator. They require no expert knowledge, and it is therefore not surprising to find many makers of this type of heater.

For this reason, perhaps, the statements of the representatives of these makers cannot be taken as strictly accurate, but this hardly excuses the gentleman who at the Exhibition—prefacing his remarks to the writer by stating that he was both a scientist and an engineer—claimed for the convector a much higher efficiency because, "in the radiator so much energy was lost in driving the heat from the filament across the vacuum." He triumphantly emphasised this theory by a reference to the Thermos flask. He was unable to explain further, but claimed respect for himself and his firm, because they had been at the business for 60 years.

Another explained that the reason the public left electric heating alone was the inefficiency of the lamp radiator. "You see," he said, "the makers frost the lamps so as to hide the light. If it were left very bright, everybody would realise that the electricity was being largely used for making light and not heat."

His firm employs several thousand persons. They both seemed serious.

None of them were able to claim the installation of electric heaters for the warming of large buildings, and it is very doubtful if there are many small buildings exclusively heated by electricity in this country. Probably what few there may be, are occupied by electricians.

Electric heating, it may be assumed, is at present confined to small rooms, offices, and intermittent use.

When sitting in a cold room the body soon feels cold. It is this which the heating apparatus must counteract. There are two methods of doing this, the first being to supply sufficient heat to the body to make up for the loss, and the second, to prevent the body losing an unnecessary amount of heat.

The first is the one usually adopted, and it can be done by all the known methods of heat transference. These are:—(1) conduction; (2) convection; (3) radiation.

The first requires actual contact, the second requires the presence of a liquid or gas as the heat is carried by the particles from the hot body to the cooler body. Radiation is, however, entirely different. It passes from the hot body to the cold body through a vacuum or intervening medium without heating that medium. Everything will not permit radiation to pass. If it does not it converts it into heat with a rise in temperature. The material then radiates again on its own account. Conduction is not very convenient or satisfactory. Few people would care to have heated chairs, &c., in which to repose.

Convection requires first the heating of the air, and, as this must be constantly changing, the efficiency of this method must be low. Warm air rises to the ceiling, so some considerable time must elapse before the body feels its effect. Further, hot air is enervating, so that the normal action of the body in making heat is reduced. All these reasons combined seem to condemn this method.

Radiation is the third method by which heat can be given to the body. As this does not heat the air, except indirectly, and as it can be directed and focussed on to the body, it seems to be the most satisfactory solution.

D

That it is the most satisfactory can be judged by the fact that in this country most of the heating of private houses has always been by this method. Heating of air always produces a complaint of stuffiness.

Most Englishmen find a German hotel in the winter almost suffocating, and would prefer the cold air and the radiant heat to be obtained on the mountains in sunny winter weather.

To prevent the body radiating an unnecessary amount of heat is not so usual. Sufficient clothing is one easy way, but not very convenient. The other way is to bring all the surrounding objects to such a temperature that the body does not radiate too much heat to these objects.

To keep all surrounding objects at this temperature seems difficult, but the most important objects—the floor and the walls of the room—do not offer insuperable difficulties. A wire woven into the wall covering and the carpet, both suitably heat-insulated at the back, would soon do this.

What the actual result would be is difficult to say without experiment, but it is probable that, with a suitable temperature of wall, a considerable amount of cold air could be allowed to pass through the room without feelings of discomfort.

As electric heating is likely in the future to play an important part in the improvement in the conditions under which town dwellers now live, it is desirable to have some means of comparing electric heaters. The temperature to which they will raise the air in a closed room in a given time is valueless. The readings of a thermo-couple giving mean spherical radiation are not much more useful.

A test should be taken in a room with a definite amount (not too small) of air passing through, and the result should, if possible, be expressed in the power to make people comfortable.

A method which suggests itself is to measure the amount of energy necessary to keep a defined body at 100° F., or other suitable temperature. The value of the heater is, of course, inversely proportional to the figure obtained.

A small copper vessel filled with water or oil with a resistance inside might be used. It might be covered with a woollen jacket. The vessel should be heated to, say, 100° F., and placed a suitable distance from the heater. The current it is necessary to send through the resistance in order to keep the water at this temperature must be found by trial, and, of course, the smaller the current required, the more efficient the heating apparatus.

This is a somewhat laborious method, but if the theory is accurate it could be undertaken, unless a more simple test can be devised.

In appearance the lamp radiator, in spite of the beautiful metal work, cannot be compared with the Ferranti fire or some of the Bastian heaters, but the material is at a higher temperature, and therefore radiates more heat which may, however, not all get out. Further, the red hot heater is almost black in very cold weather, just when its greatest radiation is desirable. If the resistance wire had a very much higher temperature coefficient, it would be, to some extent, automatic in its action. It may be possible to find an alloy as suitable in other respects as nickel chrome with this added advantage.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Utilisation of Crude Petroleum for Electric Power Production.

I have read the above article with considerable interest. It seems to me, however, that the endeavours which are being made to generate oil gas from crude oil for use in gas engines are rather futile, seeing that this oil can be used direct in the Diesel engine, with most satisfactory results. By so doing, the whole of the complications of the producer are done away with, resulting in a large saving of capital, attendance and repairs and maintenance.

The working results given regarding fuel consumption are also vastly inferior to those which are obtainable in every-day running with the Diesel engine. The figure of 8 B.H.P.-hours to the gallon is mentioned, whereas, with a Diesel engine, 18 B.H.P.-hours can be obtained with the same expenditure of fuel.

In view of the above, and the fact that the Diesel principle of working is so superior to gas-engine practice, there being no trouble due to pre-ignition, missfiring, back-firing, and so on, it seems very unnecessary to go to the trouble of gasifying the oil, when it can be used far more economically and easily direct in the cylinders of the Deisel engine.

Wm. J. U. Sowter.

Bray, *December 12th*, 1911.

The Governing of Water Turbines.

We have here a water turbine of the submerged type driving a 25-KW. alternator, which is usually run to supply our dayload, and, as there are no governors attached, the speed regulation is done by hand. This arrangement worked quite well while the load was purely a lighting one, but recently we have connected several small motors of 3-5 H.P. each. As these are only run intermittently, and require a considerable current to start them, the effect on the lighting is very bad. It seems that a governor on the turbine would not be particularly satisfactory, owing to the sluggish manner in which governors work and their strong tendency to hunt.

It has been suggested to me that the best way to deal with the matter would be to connect an artificial load and provide means whereby this load could be regulated automatically so that the generator always ran at a constant output, irrespective of the actual demand upon the external circuits—the energy consumed, of course, costing nothing for power to produce it.

I shall be greatly obliged if either you, or any of your readers, can inform me whether there is such a regulating device upon the market, and where it can be obtained.

Wm. J. U. Sowter,
Engineer and Manager.

Electricity Works, Bray,
December 16th, 1911.

Grouping of Underground Cable Conductors.

It is desired to improve the transmission of a long telephone trunk line by increasing the weight of copper in the underground cable connecting the aerial lines with the exchange. The cable is 2 miles long, and consists of 20-lb. conductors. It is proposed to use two cable pairs instead of one; but the correct method of connecting up is not quite clear.

The views of your readers will be esteemed, having consideration for the advantage and disadvantage of each method, with special reference to K and overhearing.

The cable in question is of the air-space dry-core type similar to a standard telephone cable.

Nodrog.

December 10th, 1911.

The Electrical Trades Benevolent Institution.

Now that winter is upon us, and calls are sure to be made on the Electrical Trades Benevolent Institution, I must beg the members of the electrical industry kindly to give it their further support.

The amount which has been invested since January 1st is £962 18s., and it is most important that this should be brought up to £1,200 before the end of the year. I therefore trust that I shall be forgiven for again begging.

Pensions must be paid only out of the interest on invested funds, and consequently it is essential that we should build up these more rapidly than has been the case.

Many questions are asked me from time to time regarding the position of the Institution in view of the National Insurance Bill. Permit me to say that the majority of

those who have benefited, or are entitled to benefit, by the funds of this Institution, are outside the scope of the Insurance Bill. Beyond this, the benefits given by the Institution differ in character and extent from those given by the Insurance Bill.

F. B. O. Hawes, *Secretary.*

18, Park Mansions, Vauxhall Park,
South Lambeth Road, London, S.W.
December 18th, 1911.

The National Telephone Co., Ltd.

My attention has been called to a circular letter headed "The National Telephone Co., Ltd., established in 1881," which purports to give recent statistics referring to the company, extracted from the half-yearly report of December 31st, 1910, and for the half-year ending June 30th, 1911.

The statements and figures in this circular contain many inaccuracies, and in particular a statement purporting to show the total sum that may be expected to be available for distribution amongst the deferred stock holders is entirely speculative and unwarranted.

From the way in which the circular is printed, more particularly the heading, and also from the fact that no address and name are given showing by whom it has been issued, the inference is probably intended to be drawn that the document has been issued by the National Telephone Co., and I shall be glad if you will allow me to give warning to any who may receive a print of the circular that it in no way emanates from the company.

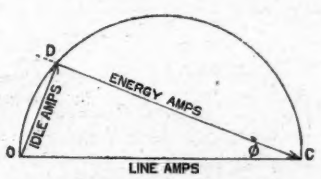
George Franklin, *President.*

London, E.C., *December 18th*, 1911.

Two-Wattmeter Method of Measuring Power in Three-phase Circuits.

A simple extension of your correspondents' methods would be to find the idle current directly by dividing the difference between the wattmeter readings by the line volts.

Also from the equation (line amperes)^2 = (idle amperes)^2 + (energy amperes)^2 obtain the energy current.



Then, by plotting the total amperes to a scale and setting off the idle current to same scale as shown in the subjoined sketch, the energy current can be shown, and the angle DCO will be the angle of lag, or the same may be calculated from the ratio $\frac{\text{energy amperes}}{\text{total amperes}}$.

F. W. Foster.

Birmingham, *December 14th*, 1911.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Large Citroën Gear Wheel.

The accompanying illustration, fig. 1, shows a large Citroën gear wheel undergoing the process of having the teeth cut in the rim. It is claimed that this wheel is the largest and heaviest machine-cut helical wheel ever made, and the figure illustrates the fact that the teeth are cut in the solid blank

The set of gearing is intended for a copper rolling mill. The pinion is direct driven by a Westinghouse motor, and is fitted on a heavy shaft which carries on each side of the pinion a fly-wheel 2·6 m. in diameter and weighing 8 tons. The wheel is fixed on a shaft between two bearings, and this shaft is fitted with a clutch enabling the gears to drive on one side the large rolling mill, and on the other side a series of minor mills in case of any of their respective motors becoming defective.

The electric motor develops normally 300 H.P. at 240 R.P.M., and is fitted with an auxiliary regulating motor enabling it to stand momentary overloads of 100 per cent. and an overload of 50 per cent. during comparative long periods.

The normal speed of the wheel is 34 R.P.M. Taking the fly-wheel effect into consideration, the instantaneous power which this system can develop (at the moment of inserting the metal in the

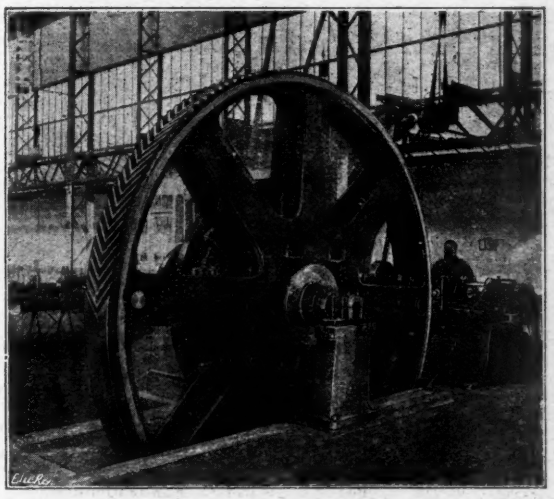


Fig. 1.—Large Citroen Gear Wheel.

rolling mill) corresponds with 1,450 H.P. The sizes of the gears are as follows: Pitch circle diameters, 644 mm. and 4,508 mm.; ratio of gearing, 7/1; number of teeth, 20 and 140; pitch, about 4 in.; width of face over teeth, 350 mm.; the teeth are shrouded to pitch line on both sides; total width over shrouds, 460 mm.; finished weight of wheel, 14,500 kg.; finished weight of pinion, 720 kg.

As will be seen from the illustration, the teeth are cut in one operation.

Adams Pressure-Controlled Speed Regulator.

One of the recent Igranic switchgear developments of the Adams Manufacturing Co., Ltd., of Bedford, is in the direction of pressure-controlled speed regulators for forced-draught fans, air compressors, feed pumps, &c., in which automatic features may be introduced.

Speed regulation may be obtained by means of armature resistance only, or by shunt field and armature resistances combined; the resistance regulating lever is actuated by means of a hydraulic

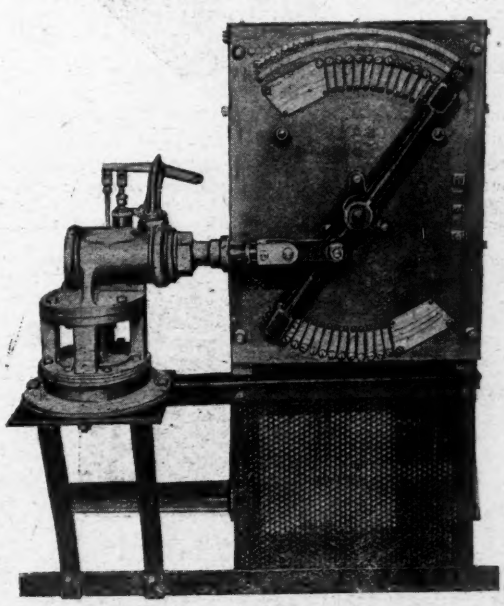


Fig. 2.—Adams Automatic Speed Regulator.

or air-pressure cylinder, the action depending on the movement of a pressure diaphragm, which is communicated in turn to a weighted lever and pilot valve, the latter controlling the actuating cylinder. Step-by-step regulation is provided, and in the event of failure of the supply or the motor being shut down, the controller automatic-

ally returns to the position of all resistance in circuit with the armature ready for another start. The system is adapted for either A.C. or D.C. motor control, and is illustrated in fig. 2.

Electrical Beer Raising Engine.

A large proportion of the publicans in Britain use compressed air to raise their beer from the cellar to the bar. Hitherto it has been necessary, as a rule, to work a small compressor by means of

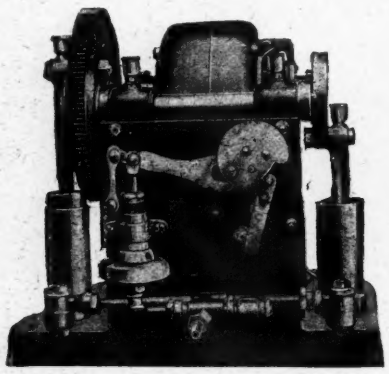


Fig. 3.—Gear-Driven Beer-Engine.

a hydraulic engine, but the cost of the water to operate the latter is somewhat high. A much cheaper arrangement is an electrically-operated engine, supplied by the Scottish Manufacturing Co., of 2, West Regent Street, Glasgow; some 200 of these machines have been supplied, and the cost of working has in no case exceeded 15s. per annum.

This device, known as the "Scottish Champion" electric auto-pneumatic beer raising engine, consists of a small motor, of ⅛th to

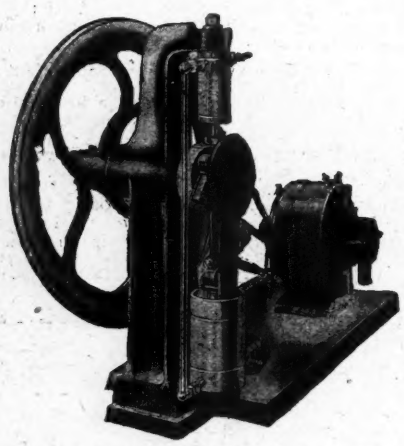


Fig. 4.—Beer-Engine Belted to Motor.

¼ H.P., according to requirements, coupled either by gearing, as shown in fig. 3, or belt, as in fig. 4, to a small single or double-acting pump, and fitted with an adjustable automatic switch, fig. 5, which is attached to the air outlet and stops or starts the machine,

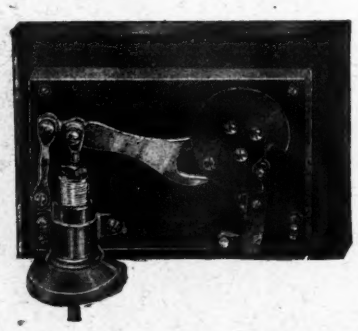


Fig. 5.—Automatic Switch.

as the air pressure varies. Fig. 6 shows a complete installation, with a gear-driven engine and automatic switch, storage tank, piping and pressure gauges behind the bar to enable the attendant to regulate the pressure to any barrel.

The air storage enables the publican to raise the beer for hours, if the motor or electric supply fails for any reason. The actual

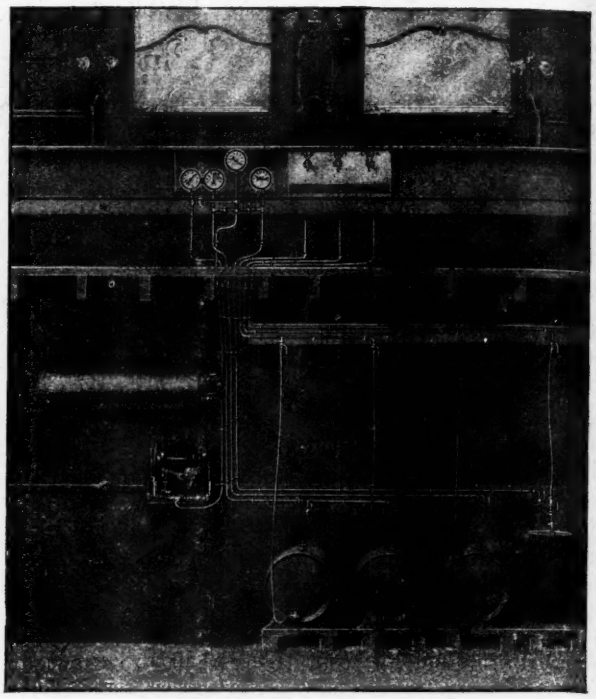


Fig. 6.—Electrical Installation for Beer Raising.

cost for electricity is about ¼d. per hogshead of beer drawn, and per annum represents a saving of from two-thirds to four-fifths of the cost of running a hydraulic engine.

"M. E." Printing Motor System.

Messrs. Marryat & Place, of 28, Hatton Garden, E.C., have introduced recently the Marryat-Elliston patent equipment for driving rotary newspaper machines. It consists of an electric motor coupled direct to the printing machine through an electric clutch of special design; the motor and clutch are controlled by an ordinary solenoid starting switch and a shunt resistance, which can be so arranged as to allow a frictionless slip upon the clutch through the complete range of speed from less than 2 per cent. of full speed up to full speed or above normal full speed. The controller can be operated by a simple lever, with various positions

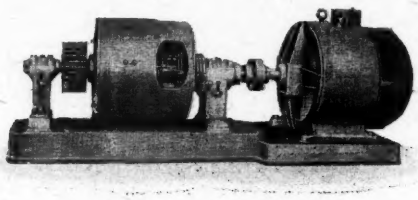


Fig. 7.—The "M.E." Electric Drive for Printing Machines.

corresponding to the different speeds, or by a series of push buttons. It is claimed that the equipment fulfils all the requirements of newspaper printing work, and in addition affords facilities for the provision of reverse motion. Very smooth acceleration from inching speed to full speed or *vice versa* is provided by the apparatus, which possesses also the merit of great simplicity. It must be borne in mind, however, that the use of a slipping clutch, of no matter what type, involves loss of energy, as the power expended is measured not by the torque × speed of the driven machine, but by the torque × speed of the motor; the difference between these quantities will appear in the form of heat in some part of the system.

Tube Station Lighting.—In our reference a fortnight ago to the "Onewatt" lighting of the Oxford Circus platforms of the Central London Railway, we stated that the uniform illumination value was "4½ candle-feet" at a height of 4 ft. above the platform throughout its entire length. We now learn from the makers of the lamps that this should read "1½ candle-feet."

Germany.—A company has just been formed at Berlin, styled the Deutsche Aero-lampen Gesellschaft m.b.H. Its object is to work the patents of the above-named lamp and improvements of the same. Its capital is 20,000 marks.—*Elekt. und Maschinenbau.*

SOUTH AFRICAN NOTES.

[FROM A SPECIAL CORRESPONDENT AT CAPE TOWN.]

Cape Town Corporation.—The British Insulated and Helsby Cables, Ltd., were awarded the contract recently for the following cables:—1,000 yds. of ·8 × ·4 × ·8; 2,340 yds. of ·5 × ·25 × ·5 with three-pilot wires; 300 yds. of ·25 × ·25 × ·25; 370 yds. of ·125 × ·0625 × ·125; 1,000 yds. of six-core 3/20 armoured and juted cable.

The report of the city electrical engineer on the running of the plant and output and distribution of current for the month of August, 1911, compared with 1910, shows the total number of private consumers in Cape Town to be 1,658, as compared with 1,459 in the same month last year. Woodstock 32, compared with 19; Green and Sea Points 152, compared with 69; and the number of lamps, equivalent to 8 C.P., 155,566, compared with 133,153. The H.P. of motors increased from 3,275 to 3,943 H.P.

Municipality of Robertson, C.C.—A scheme for electric lighting of this municipality has been talked of for some years, and a short time ago the town clerk was instructed to write to the Cape Town Corporation to ask for the services of their electrical engineer. This was agreed to, and Mr. Long has visited Robertson and is now preparing a scheme to utilise the small amount of water-power supplemented by oil engines.

Swellendam, C.C.—This Council is also considering the installation of electric lighting within the municipality.

Cape Town Electrical Exhibition.—This exhibition has been promoted by the Corporation with a view to advertising the many uses to which electricity can be put and its many advantages. The exhibition was held in a disused building, formerly in the occupation of the Railway Department, and was quite in the nature of an experiment. Apparatus was lent by the following firms: Messrs. Siemens, British General Electric Co., R. M. Ross & Co., E. A. Shaw & Co., Geo. Findlay & Co., Jac Loopuyt & Co., and Mechileys, and the furniture and pictures by "The Louvre" and Perry & Co. It included sign flashers, fans, flame arc lamps for the outside, four or five ovens, numerous kettles, radiators, hot plates, toasters, irons, vacuum cleaners, &c.; also motors electric drills, an electric floor scrubber and polisher, and a large assortment of fittings.

The two novelties were an American griller and an instantaneous hot water boiler, both of which took very large currents, but on test proved most efficient. The two views sent are of the drawing room and of the kitchen, where a Malay servant is attending to the vegetables for a luncheon, which was specially cooked by two local ladies for the Committee, to demonstrate the low cost of electricity at 2½d. per unit, compared with gas at 9s. per 1,000 cb. ft.

From the point of view of the public's interest the exhibition has been an unqualified success, and Mr. Long is to be congratulated upon his experiment.

It is proposed to have a much more representative exhibition next year to be held in the City Hall, and a considerable amount of support has been already promised by local firms.

The exhibition was open from 11 a.m. to 5 p.m., and from 7.30 to 10 p.m. The attendance during the day was always very fair, and during the evening the place was packed, the interest chiefly centring upon cooking and ironing. This can easily be accounted for with gas at 9s. per 1,000 cb. ft., coal at 42s. to 45s. per short ton (2,000 lb.), and paraffin oil at 1s. 1d. to 1s. 1½d. per imperial gallon. Paraffin easily holds the field on account of cost, and is easily understood by coloured servants. There is no doubt that such an exhibition is of great value in educating the public, and as the cost of current decreases, which it is steadily doing, there will be a large demand for cooking apparatus in the Cape peninsula.

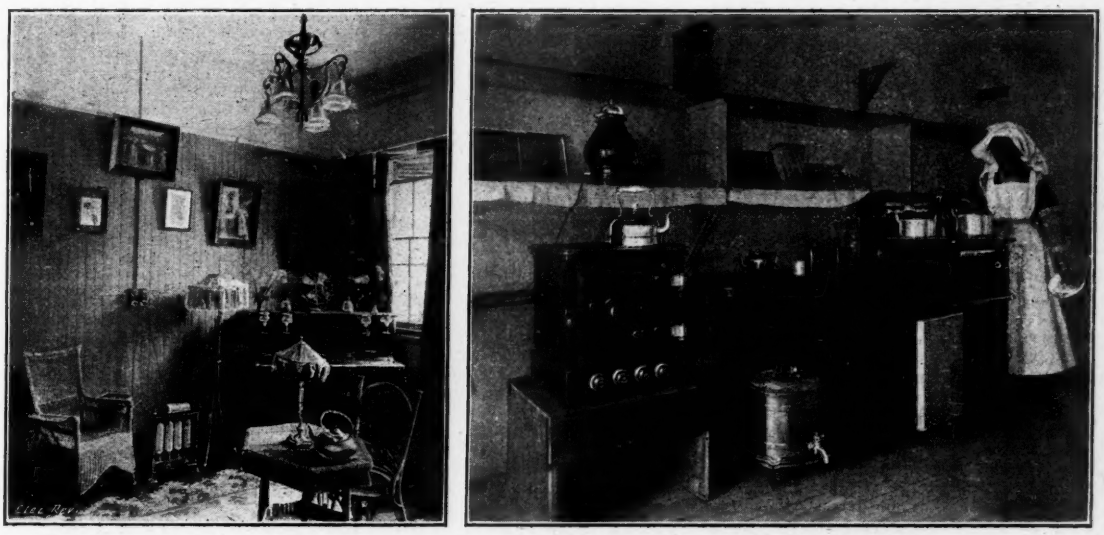
A SUCCESSFUL IRISH PEAT-GAS PLANT.

THE peat plant here described has been working at the factory of Mr. Hamilton Robb, Portadown, since the early part of September with entirely successful results. The plant, which has a capacity of 400 B.H.P., consists of two producers, each of 200 B.H.P. capacity, with a coke scrubber, tar extractor, sawdust scrubber, exhauster, and expansion box.

The operation of the plant is extremely simple, the peat being hand fired into feeding hoppers at the top of the producer, from which it falls by gravitation into the body of the producer as combustion of the lower layers of peat takes place. The gas, as formed, passes through the coke scrubber to the tar extractor, where the tar is separated from the gas by centrifugal action, the gas thence passing to the sawdust scrubber, where the final cooling and cleaning take place. The gas is drawn through the plant by an exhauster or high-speed fan, which delivers it to a gas holder for use in the engines.

The nature of the gas produced is similar to that of suction gas from Welsh anthracite, though it contains a smaller percentage of hydrogen gas, and the thermal value is slightly more—about 140 B.TH.U.

The peat fuel is cut from the boglands at Maghery and dried by the ordinary open-air method. In this way the peat originally containing about 85 per cent. of moisture can be dried during an average drying season to contain about 26 per cent. of moisture. During the last exceptional summer the peat was actually dried in the open air to as little as 19 per cent. of moisture, as shown by chemical analysis. The plant, however, is guaranteed to work with peat up to 45 per cent. of moisture, though it is naturally not so economical to use peat in such a wet state owing to the excessive cost of carriage in proportion to the effective fuel content in the peat.



CAPE TOWN ELECTRICAL EXHIBITION: ELECTRICALLY EQUIPPED DRAWING-ROOM AND KITCHEN.

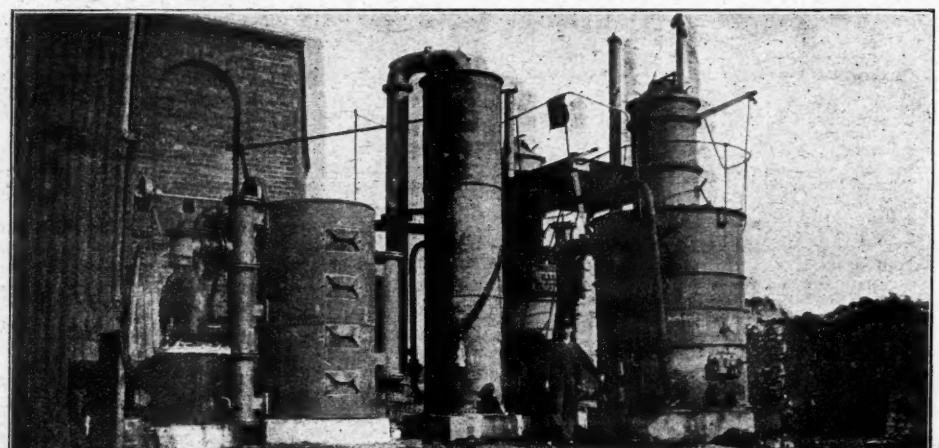
The cost of the peat delivered on site at Portadown is 6s. per ton, the amount of peat consumed per week with an average load on the plant of 275 B.H.P., being slightly under 20 tons at a cost of £6; from this must be deducted the value of the tar recovered from the plant, which averages 35s. per week, leaving a net cost in fuel of £4 5s. Previously the factory engines were driven by a Mond gas plant, using 8½ tons of anthracite per week at a cost of £13 16s. 3d. With the peat plant at present one more labourer is required, but it may be found possible to dispense with this additional labour later on. Allowing £40 for additional wages the saving effected in the cost of fuel in a factory of 500 looms, employing from 5 to 600 hands is £438 a year.

As regards the working of the plant, the Mond anthracite plant has been kept as a standby, and although it is not now ever called upon, it was found very useful in the early stages of handling the peat plant before the men had got used to it. The initial difficulty was learning how to control the amount of gas made, as sometimes this was altogether in excess of requirements, and at other times it was entirely insufficient. One of the earliest troubles was experienced from a very unexpected cause. Owing to the exceptionally dry summer, the peat which had been stacked to dry near the shores of Lough Neagh, had become considerably impregnated with sand blown from the shores of the Lough. This sand collected on the grate bars of the producer in the form of a crude black glass blocking up the bars completely and stopping the generation of gas. The trouble was quickly cured by adjusting the amount of air admitted between the bars and by introducing a certain amount of water vapour into the main air supply to the producers. No further trouble has been experienced from this cause.

When the plant was originally put down, it was arranged to cut

the peat fuel into blocks of about 5-in. cube before feeding it into the hoppers. This being found troublesome and expensive, the feed hoppers were altered and the peat is now fed in blocks direct as they come from the boglands.

The only other trouble experienced was in connection with the coke scrubber. As the gas passes through this before it reaches the tar extractor, a large amount of tar was thrown down on the coke, especially on the bottom layers and the scrubber rapidly became choked, requiring attention every five or six days. Eventually the scrubber was modified so as to act as a washer and cooler; the major portion of the coke was removed, the gas passing upwards against a descending shower of water. Removing the coke had a double advantage, inasmuch as not only was the initial expense of the coke saved, but more tar was thrown out by the tar extractor instead of being deposited in a worthless condition on the coke.



Factory Peat-Gas Plant of 400 h.p., at Portadown, Ireland.

As regards the tar, this is being sold at a price of about 35s. per ton, the amount of tar recovered being 5 per cent. of the weight of the fuel consumed, or, say, 1 ton per week. The tar on analysis was shown to contain a slight amount of paraffin wax and a considerable proportion of heavy oils distilling above 270° C.

This plant, which is the only instance in the British Isles of the direct utilisation of peat for power purposes, is now working daily giving no trouble whatever, the only operations required are the stoking of the plant and the cleaning of the ashpits. Owing to the open nature of the fuel, it is found that no "poking" such as is necessary with coal plants is required; the operation of the plant is, therefore, very simple.

The above plant was constructed by Messrs. Crossley Bros., Ltd., Openshaw, to their designs under the specification of Mr. H. V. Pegg, Assoc.M.Inst.C.E., of the firm of Messrs. T. L. Miller, Wilson and Pegg, consulting engineers, Manchester.

BUSINESS NOTES.

Trade Conditions in Buenos Ayres. — We have perused with great interest a report on the conditions and prospects of business in Buenos Ayres which has been drawn up by Mr. Alfred Gibbings, who, as was announced in these pages several weeks ago, is now established in business as Alfred H. Gibbings y Cia., at Cangalla 564, Buenos Ayres. The report has been endorsed by the British Consul there, and a copy is in the hands of the Board of Trade in London. The necessity for giving information as fully as possible in catalogues does not appear to be sufficiently recognised by British firms, a point in respect of which they compare unfavourably with German and other foreign firms. It is advised that catalogues should not be prepared in volume or pamphlet form, as postage of all printed matter is very expensive, and each district and client is usually interested in one speciality only. Mr. Gibbings recommends that each speciality should be contained on one leaflet or sheet, about quarto size, or four pages folded, or eight pages at the most, folded and stitched. A light weight paper should be used and ample space left for the agent to print his name and address. The Spanish language should be used in catalogues and prices must be stated in Argentine gold pesos or moneda nacional. Each catalogue should be accompanied with a detailed statement in the Spanish language of the contents (stated in the metric system), and value of the goods, with all necessary calculations worked out ready for the importer. In Buenos Ayres, it appears, owing to the buildings having few floors, rents are about double what they are in the City of London, and the costs of living are on a similar scale. In regard to clothing, ordinary felt hats cost from 20s. to 45s. each, suits to measure average £9 to £12, and boots about 25s. to 45s. the pair. A small house costing £60 per annum for rent at home is there about £250. Electric light is 10d. per unit and electric power 5d. Prices are high because nearly everything has to be imported. There are few factories of any kind, and there is no coal. The country is rich, and is gradually developing new industries, and the possibilities and prospects are excellent. There are good openings for manufacturers and factories for several articles, and such enterprise is encouraged. The largest demand is for agricultural and such like machinery, and for railway extensions. In the latter no great engineering difficulties are met with, as the country is level.

Good openings exist for every class of novelty, and in engineering for specialities of economical value. For example, windmills are used largely for irrigation and pumping, but these are unsatisfactory and irregular. Steam pumps are expensive to run owing to the cost of fuel, and electricity is only available in the vicinity of large towns. Petroleum has been found in the southern territories, and is the monopoly of the State; but carriage is costly, and the calorific value is low, yet this seems likely to be the prime mover of the future. There are openings for complete sewage schemes in many small towns. Small electric installations for towns are also possible. Mr. Gibbings does not yet know to what extent petrol gas may be employed. Many of the villages on the lines of the network of railways are rapidly growing in importance, and the railways are constantly extending into new districts. In the country around Tucuman there is enormous sugar cultivation, and further up to the north-west there is much mining development. All this vast country is served by imports through Buenos Ayres, Rosario, or Bahia Blanca, and even to the confines of Bolivia the access is easier from the Atlantic than from the Pacific owing to the barrier of the Andes. The capital invested in the Argentine railways is largely held in England, and the expenditure of any large sums for works, rolling stock and extensions is settled and carried out in England. Messrs. Livesey, Son & Henderson have considerable influence in this direction, and as regards the proposals to electrify the suburban lines of the Central Argentine and the Western Railways, Messrs. Merz and McLellan are the consulting engineers. The Central Argentine are proposing to go ahead at once, and the Western will follow later. With regard to the placing of orders, local wishes and local experience have to be considered, and those in touch in Buenos Ayres with the chief officials are in the best position to deal with the matter. Quite recently, instances have occurred in which large sums have been wasted owing to designs being made entirely in England without local references. The tramways and electric light undertakings are principally in the hands of the Germans. The new hydro-electric power scheme at Tucuman is Westinghouse, but there are some projects coming on which are in British hands. The prospects of business in some of these directions should be good.

The foreigner—*i.e.*, the British, American, German, French and Italian—is the importer into the country. The real Argentine has not taken a prominent part in the import business for two reasons: he has not the knowledge, and he is making more money out of the export business. Everybody buys land, and consequently there is little investment in industrial concerns, and now is the time to establish factories in the country. Three months' credit is the usual arrangement, but this is a matter which must be gone into carefully as each case arises. The Germans, through their banking houses, give credit to a considerable extent. All the important firms in Buenos Ayres hold stocks of the goods they sell, and the showrooms of all classes of machinery and almost of every class, size and description are fine and most extensive. This, of course, can be understood in a country where there are no manufacturers, and where goods are

often wanted urgently. There is no alternative for a manufacturer who wants to do business here but to carry large stocks of goods, where such goods have to meet the competition of others of their class. In this category must be included all standardised articles such as small gas engines, oil engines, dynamos up to 30 KW., motors, pumps, electrical instruments, electrical switchgear and accessories. In the case of specialities properly protected under registration or patents, there is not so much necessity to hold stocks, unless, of course, a large demand is likely to result immediately. It is, however, absolutely essential that a set of the complete apparatus be held for inspection, and, where necessary, to show operation. It is impossible to sell from catalogue only. These remarks do not apply to the sale of large units of generating sets, boilers, steam engines, turbines, and apparatus which has to be especially made. All models and sample apparatus must be capable of being shown in operation, and complete drawings and data are necessary. Precaution should be taken against possible infringement and copying, by German or other concerns making or offering a close imitation, if not an actual copy

In addition to the Customs duty and freight charges, there is a charge made for dock dues, and a commission has to be paid to a recognised agent to get the goods cleared at the Custom House. In some cases for small consignments, these subsidiary charges amount to as much as the duty, and in one case equalled the value of the invoiced goods.

The methods here of securing orders are quite in opposition to English ideas, and the quotation that "it is better to know the judge than the law" applies all round.

Consular Notes.—Japan.—In a recent report on the trade of Japan, the British Commercial Attaché points out that the imports under the heading of machinery in 1910 again showed a considerable decrease, amounting to some 22 per cent. compared with the total for the preceding year. In 1909, the falling off was ascribed mainly to stagnation in the industrial world. The gradual recovery witnessed in 1910 had not been in existence long enough by the end of the year to affect the amount of the annual import, but, to judge from the amount of capital invested in the formation of new and the extension of old industrial concerns during the past year, the prospects of the machinery business for the coming year are comparatively rosy. Other factors conducing to the same result were the organisation of a large hydro-electric power scheme and preparations for establishing two or three more similar undertakings, also the proposal of the Government to introduce into the 1911 session of the Diet a Bill for subsidising light railways, which was subsequently passed. The alteration of the tariff, which took place in July, also caused orders to be placed for machinery to be delivered before the new tariff came into force. An interesting feature is the increase in the use of gas engines. Small engines using gas supplied by a local gas company are employed with motors for the supply of power to small factories. Larger factories, small municipal electric light undertakings and similar enterprises have recently begun to install suction gas plants for the generation of power where water-power is unavailable, as gas is found cheaper than steam or oil. At the end of the year the Imperial Government Railway Board made a contract with a British firm for the erection of a power station, the electricity to be generated by gas engines. Speaking generally, gas engines imported are chiefly of British manufacture. The increase in the import of telephones is due to the rapidly growing demand. The imports, however, represent chiefly desk and office telephones. The telephone service is a Government undertaking, but the authorities have not been able to keep pace with the large number of applications for installations which are continually being received. At the end of the year there were 128,000 telephones in operation throughout the country, and 66,000 applicants waiting to be supplied. The Government obtains telephones from two factories in Tokio, one of which is a Japanese and the other a joint American-Japanese concern. Telephone cables are imported, but doubtless an attempt will soon be made to manufacture them in Japan. An opening would appear to exist for petrol engines. These are fitted to Japanese "sampans" and small junks. They are also required for motor-cars, the bodies of which can be made in Japan. It is feared that the alteration of the tariff from an *ad valorem* to a specific basis as regards most kinds of machinery will exercise rather an unfavourable influence. The alteration is welcomed as placing an obstacle in the way of fraudulent under-valuation of goods for Customs purposes; but the difficulty experienced in quoting a price for plant composed of various sections, many of which are liable to specific duties at varying rates, can easily be imagined. It is expected that under the new tariff the import of manufacturing machinery, such as for spinning, weaving, &c., will tend to increase. Such machinery cannot yet be manufactured in Japan, but it will be additionally required with the growth of industrial enterprises.

It is disappointing to find that although all the chief countries supplying machinery to Japan showed decreases in their total deliveries, by far the heaviest decrease was that of the United Kingdom, amounting to £454,000, or 32 per cent.

Later in his report the Commercial Attaché states that the year 1910 witnessed steady progress in the direction of extending the use of hydro-electric power for lighting and industrial purposes. In October the Kinugawa Hydro-Electric Power Co. was formed with a capital of £1,378,125, for the purpose of supplying the city of Tokio with electricity generated from the Kinu River. This company was originally projected as a joint Anglo-Japanese undertaking, but the British capitalists subsequently withdrew owing to their unwillingness to accept the conditions which the Japanese authorities attached to the issue of the charter. In April a Government Commission was appointed to examine and make a record of the water-power resources of the country. By this means the Government hope to assist the development of the use of water-power, and, at the same time, to guard against the granting of water-power concessions to persons seeking to obtain them for speculative purposes. The water-power for which charters have been granted by the authorities is estimated at some 592,000 KW. On the other hand, statistics published by the Department of Communications at the end of 1909 put the amount of water-power sanctioned at 73,507 KW., and the amount not yet sanctioned, but presumably applied for, at 176,552 KW. In addition to the use of hydro-electric power for lighting and traction purposes, there is undoubtedly a great future for it in supplying the requirements of factories and mines of all kinds. Besides the power stations already erected, a large number are in contemplation, or are in course of erection. The number of new proposals for light railways and lighting and for extensions of existing concerns has increased during 1910. In August a light railway law was put into force.

The object of this law is to enforce proper control over the promotion of schemes for constructing light railways, and also to encourage the construction of such lines in order to connect minor centres of trade and production with the existing lines of railway. The nationalisation of the railways has had the effect of checking private enterprise in this direction, while the State is unable to spare funds sufficient to meet the demands for railway extension. Consequently it is hoped that this law will attract private capital to the construction of light railways. A more powerful fillip to this industry was given by the news of the Government's intention to introduce into the 1911 session of the Diet a Bill for granting subsidies to light railways. (This Bill was passed by the Diet. The date of its coming into force is not yet determined.) It should be repeated here that, on account of the financial standing of some of these undertakings, it is advisable for British merchants to do business with them only through firms or representatives in Japan, as the latter are in a position to ascertain whether contracts can safely be accepted. Most of the light railways use electricity as their motive power and also undertake the supply of electric light. During the year a number of orders have been received for the erection of small plants for the supply of electric light, the power being generated by gas engines. In the industrial cities of Osaka and Tokio a large and growing demand exists for gas engines for use in small factories. As showing the growth of gas companies, it may be mentioned that there are 65 companies in Japan either in operation or in course of promotion. The capacity of the smallest of these companies is 35,000 cb. ft. of gas per day.

Bankruptcy Proceedings.—ARTHUR PARKER, electrical engineer, 8, Mary Street, late 57, Yorkshire Street, Burnley, Lancashire.—The liabilities herein amount to £175, to meet which there are assets of £35. The following are creditors:—

Baxendale & Co.	£42
Calverley, G. H., & Co.	26
Edison & Swan United Electric Light Co. ..	56
Siemens Bros., Ltd.	15

BERTRAM NEWMAN, electrician, Ilford.—First meeting, December 28th, at 14, Bedford Row, London, W.C.; public examination, January 3rd, at Shire Hall, Chelmsford.

THOMAS TOPPING, electrical and mechanical engineer, Southport.—First meeting, December 28th, at 35, Victoria Street, Liverpool; public examination, January 15th, at Court House, Victoria Street, Liverpool.

CHARLES WALLIS, electrical engineer, Great Grimsby.—First and final dividend of 1s. 9d. in the £, payable December 22nd, at St. Mary's Chambers, Great Grimsby.

EDWARD EVANS PUGH, electrical engineer, &c., Station Hill, 10, Cavendish Circus and Park Garage, Buxton.—The public examination herein was held on December 15th at the Court House, Vernon Street, Stockport. The statement of affairs disclosed gross liabilities, £1,946, of which £1,855 was expected to rank for dividend. The assets were estimated to produce £652, leaving a deficiency of £1,203. Debtor attributed his failure to a serious accident to a motor-car owned by him last March, in consequence of which he lost his trade, loss on electrical contracts, and general depression in trade. Debtor commenced business as an electrical engineer—his own trade—at Wolverhampton in 1907, with a capital of £90 and an additional £100 given by his mother-in-law, the latter amount being on loan. Subsequently he was manager for an electrical engineer at Buxton. Without capital, he commenced on his own account in May, 1910, and opened a public garage, where he repaired motor-cars. He also carried on business as a toy and fancy dealer at Victoria Arcade, Buxton. In July, 1910, he purchased a motor-car on the hire system. Of the debts, £139 were for goods supplied and services rendered, £1,451 for money borrowed from friends, and interest, £359. In respect of the motor accident, he received £44, but it did not cover the damage. He lost at least £70 over that amount. Although at one time his takings were over £2,500 per annum, he did not keep a proper cash book. Debtor was ordered to furnish an account of his losses in electrical contracts, &c., and the examination was adjourned.

Book Notices.—The *Mechanical World* Electrical Pocket Book for 1912. Manchester: Emmott & Co. Price 6d. net.—This issue has been enlarged and improved; the lighting section has been divided into "Electric Lamps" and "Electric Lighting," and sections have been added on Motor Starters, Transformers, and Construction, Rating and Testing of High-Tension Apparatus, besides a number of new tables.

"The Physical Review." Vol. XXXIII, No. 5. November, 1911 Lancaster, Pa.: The *Review* offices.

"*Journal* of the American Society of Mechanical Engineers." Vol. 33, No. 12. December, 1912. Baltimore, Md.: The Society. Price 35 cents.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXX, No 12. December, 1911. New York: The Institute. Price $1.

"Dynamo and Motor Attendants and their Machines." By Frank Broadbent, M.I.E.E. 1911. London: S. Rentell & Co., Ltd. Price 1s. 6d. net.

"Wechselstromversuche." By Dr. Anton Lampa. 1911. Brunswick: Friedr. Vieweg & Sohn. Price 5 m.

"*Bulletin* of the Bureau of Standards." Vol. 7, No. 3. October, 1911. Washington: Government Printing Office.

"*Transactions* of the Concrete Institute." Vol. III. 1911. London: The "Concrete Institute."

"*Résumé* of Producer Gas Investigations, October 1st, 1904—June 30th, 1910." By R. H. Fernald and C. D. Smith. "Physical and Chemical Properties of the Petroleums of the San Joaquin Valley of California." By J. C. Allen and W. A. Jacobs. "Electrical Accidents in Mines: Their Causes and Prevention." By H. H. Clark, W. D. Roberts, L. C. Ilsley and H. F. Randolph. 1911. Washington: Government Printing Office.

"Syllabuses of Science and Technology for 1911-12, Applicable to Technical Schools, &c., in England and Wales." London: Wyman & Sons. Price 3d.

"The Record of the Special Commission Formed by the British Fire Prevention Committee to Visit Paris, August, 1911." London: The Committee's Offices. Price 7s. 6d.

"*Proceedings* of the Physical Society of London." Vol. XXIV, Part 1. December 15th, 1911. London: *Electrician* Printing and Publishing Co. Price 4s. net.

Dissolutions and Liquidations.—DAVIS ELECTRICAL CO., LTD.—A petition for the winding-up of this company was presented on December 8th, and is down for hearing on January 16th. The petitioners are Messrs. James McDougall, Ltd., of Mestycroft, Wednesbury, creditors.

RUGBY SCHOOL ELECTRIC LIGHTING CO., LTD.—This company is winding up voluntarily, with Mr. A. E. Donkin as liquidator.

EDWARDS AIR PUMP SYNDICATE, LTD.—A meeting of creditors is called for December 21st, at 3 and 5, Crown Court, Old Broad Street, E.C. Creditors must send particulars of debts, &c., to the liquidators (Messrs. C. Williamson, Milne and W. S. Gregg) at that address, by February 28th.

WENHAM & WATERS, LTD.—Creditors must send particulars of debts, &c., to the liquidators, Messrs. F. Brown & W. Peet, at 1, High Street, Croydon, by December 31st.

ISAAC STOREY & SONS, LTD.—This company is being wound up voluntarily in consequence of the amalgamation of the business with Messrs. Newman, Hender & Co., Ltd., Woodchester; Martineau, Beames & Madeley, Ltd., Birmingham; and Gaukroger, Sykes and Roberts, Ltd., Halifax, as United Brassfounders and Engineers, Ltd. Creditors should send particulars of their debts, &c., by January 20th, to Mr. A. H. Pownall, 42, Spring Gardens, Manchester, by January 20th.

WAKELIN BROS., LTD., 9, Tottenham Street, Tottenham Court Road, London.—Winding-up order made December 12th.

TRAMWAYS EXTENSION SYNDICATE, LTD.—A meeting is to be held at 5, London Wall Buildings, E.C., on January 31st, to hear an account of the winding-up from the liquidator, Mr. Edward Davis.

DAVENPORT, SPARROW & CO., electrical contracting engineers and factors, 44, Brazennose Street, Manchester.—Messrs. J. N. Davenport and H. A. Sparrow have dissolved partnership. Mr. Davenport will attend to debts, &c.

WALTERS & CO., electrical engineers, Ocean Chambers, Waterloo Street, Birmingham.—Messrs. V. E. Walters and M. R. A. Hankey have dissolved partnership.

JOHN MUSGRAVE & SONS, LTD., Globe Iron Works, Kay Street, Bolton.—This company has resolved to wind-up voluntarily, it being found impossible by reason of the liabilities to continue the business. Mr. Harold Mather, 10, Acresfield, Bolton, has been appointed liquidator.

Closed for the Holidays.—MESSRS. LAURENCE, SCOTT AND CO., LTD., of Norwich, announce that their works will be closed from noon, December 23rd, until December 30th inclusive.

MESSRS. MAWDSLEYS, LTD., of Zone Works, Dursley, Glos., announce that owing to alterations and extensions to power plant necessitated by increased output, they will be closing their works from to-night, Friday, until Tuesday morning, January 2nd.

THE ADAMS MANUFACTURING CO., LTD., Bedford, announce that their works and offices will be closed from Saturday noon, December 23rd, to Monday morning, January 1st, for Christmas holidays and annual stocktaking.

White City Exhibition, 1912.—At a gathering held at the Mansion House last week, the Lord Mayor presiding, it was decided to invite France to take part in a second Franco-British Exhibition at Shepherd's Bush during next year. A second resolution urged British manufacturers and producers to take advantage of the opportunity of bringing their products and machinery before the French visitors.

Meter Approved.—On Monday last the Board of Trade signed its approval of the "E.C." type ampere-hour continuous-current meter of the ELECTRICAL CO., LTD. This meter has self-adjusting brushes and twisted commutator.

Counting by Weight.—MESSRS. W. & T. AVERY, LTD., of Birmingham, have patented a weighing machine on a new principle, obviating the necessity of counting a bulk quantity in order to arrive at the exact number. The mechanism is simple—a fixed number is placed in a small scoop which hangs from a steelyard, while the unknown quantity is in the large scoop. The small scoop is moved along the steelyard until it balances, when the markings or graduations show the exact number contained in the unknown quantity. The firm can adapt the principle to the requirements of any particular trade.

Bradford Installations.—MR. H. MOSS has recently secured the contracts for the electric lighting of part of the works and the offices of Messrs. Cresswell's Asbestos Co., Ltd., Bradford; for electric lighting throughout the new works and warehouses of Messrs. R. Beauland & Co., Ltd., at the warehouses and offices of Messrs. Paul Schmidt & Co., the warehouses and offices of Messrs. Wm. Laycock & Sons, and power and lighting installation work at Messrs. Tordoff's brewery, Bradford; also many smaller power, lighting and electric cooking installations.

Calendars and Catalogues.—MESSRS. BRUCE PEEBLES AND CO., LTD., Edinburgh.—The desk blotting pad and calendar received from this firm a year ago having nearly done its work, we welcome the 1912 copy which has just come to hand. The reference-book this time is on the right-hand side, and in addition to well illustrated abridged specifications and price lists of Bruce Peebles electrical machinery, there are many pages of squared paper, perforated postcards for use by those who require further information, and calendars for 1912 and 1913. Along the top border of the pad there are monthly date squares for the whole of 1912. A novelty appearing in a convenient position under the reference-book is a memoranda slate whereon to make hurried calculations, which can be cleaned off as desired.

MESSRS. FERRANTI, LTD, Hollinwood, Lancs.—New edition of the firm's excellent catalogue, which we quite recently mentioned here, of electric heating and cooking apparatus—disk stoves, electric fires, breakfast cookers and flat-irons. Messrs. Ferranti have increased the discount to which the list prices are subject.

THE D.P. BATTERY CO., LTD., Bakewell, Derbyshire.—This firm is the first to remind us by calendar that the old year is nearing its end. Its 1912 calendar, like those for previous years, contains charming views of the country in the neighbourhood of the works, but this time they are excellent half-tone pictures, five in number, showing the River Wye, the weir with fish ladder, a view above the water-wheels (including the works), the dam, and a part of the works' exterior. All of the views are taken on the company's property.

THE ELECTRICAL AND ENGINEERING SUPPLIES CO., LTD., 36 and 37, Upper Thames Street, London, E.C.—Leaflet describing and giving illustrations and prices of several patterns of their motor-driven automatic sign switches, a feature of which is the standardisation and interchangeability of parts enabling quick delivery of spare parts from stock.

THE BERRY CONSTRUCTION CO., LTD., 29A, Charing Cross Road, London, W.C.—Circular announcing in detail increases in prices of "Tricity" cooking apparatus, consequent upon the continued rise in the cost of raw materials.

MESSRS. ADNIL ELECTRIC CO., LTD., Adnil Building, Artillery Lane, London, E.C.—Pamphlet No. 104, containing a brief description, with list of prices, of liquid starters for direct-current and three-phase motors. The tanks and blades are of sheet-iron, carried on substantial insulators, and the electrolyte used is a solution of soda. Worm and worm-wheel gear is provided to ensure slow and gradual starting, a sheet-iron protecting cover is fitted over the tanks and blades, and suitable short-circuiting contacts are provided. For direct-current starters field-breaking switches can be provided, and these can be mounted on the liquid starters, and can be fitted with an interlocking gear to render it impossible to start the motor up against a weak field. The starters can be supplied in various sizes from 15 up to 1,000 H.P. Copies of the list can be obtained on application.

THE MIRRLEES, WATSON CO., LTD., Scotland Street, Glasgow.—Two new pamphlets relating to their steam condensing plant. No. C30 (20 pages) contains a full account, with half-tone views and plans, and sectional line drawings, of the combined hydraulic and steam turbine generating station at Tuilière, Dordogne, France, for which a third set of condensing plant, with 14,000 sq. ft. cooling surface, is at present in the firm's works awaiting shipment. The other pamphlet, No. C31, contains particulars of the Mirrlees-Leblanc system of condensing plant with rotary pumps. The rotary air pump now offered is the outcome of very complete investigations extending over several years, and embodies patented improvements on the original Leblanc pump.

THE SILENT ELECTRIC CLOCK CO., 192, Goswell Road, London, E.C.—New edition of their pocket catalogue (48 pages) containing particulars of their electric clocks, with excellent half-tone pictures, showing their mechanism and different designs of dials. A lengthy list of installations carried out accompanies the catalogue.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—New pamphlet No. 2,253 (12 pages art paper), containing brief descriptive matter, and a number of neat half-tone pictures illustrating methods of economically applying the electric motor (either D.C. or A.C.) drive for metal-working machines. The views included show lathe, drill presses, shapers, shears, slotters, planers, milling, and other machines.

THE CABLE ACCESSORIES CO., LTD., Britannia Street Works, Tividale, Staffs.—Catalogue of 70 pages (List No. 5), containing very full information, with illustrations and prices regarding the

"Sceaco" cast-iron water-tight fittings, single-light vertical and mill fittings for various types of lamps, and for fixing to wall or ceiling, cluster-light fittings, street lighting lantern fittings, special fittings for street and other metal-filament lighting, ironclad double-pole switch and fuses, bracket arms for street and shop lighting fittings for traction columns, Britannia and other hand lamps, ships' and bulkhead lighting fittings, arc lamp winches and a number of small associated lines.

MESSRS. DICK, KERR & CO., LTD., Abchurch Yard, Cannon Street, London, E.C.—New and revised edition of their pamphlet (50-60 pages in limp red cover), entitled "Electric Traction on a Main Line Railway." The contents consist of a full and admirably illustrated description of the electrical equipment of the Lancashire and Yorkshire Railway, for which, as most of our readers are aware, the firm was responsible. A map of the routes, comparative diagrams of the steam and electric time-tables of 1903 and 1911, line drawings and photographic views of the trains and parts, tabulated data showing the particulars of the electrical equipments, curves of energy consumption, the power station and sub-station plant, permanent way-views, tables of mileages before and after overhaul, and of maintenance of the motive power portion of electric rolling stock, are given. As will be gathered from this brief summary, the book is of particular interest just now, when there are signs of a move forward in respect of railway electrification in this country and some of our Colonies.

MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., Tyssen Street, Dalston, London, N.E., are issuing their "Little Bill" showcard to the trade in the form of a postcard suitable for correspondence. Quantities will be overprinted free of charge for contractors and the trade, and early inquiries are invited from those requiring them.

MESSRS. SIEMENS BROS. & CO., LTD., and MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., of Caxton House, S.W., as in previous years, have favoured us with copies of their handy pocket diary for 1912, containing, in addition to the diary, a refill note-book, and a variety of useful data, with some excellent illustrations of their many specialities.

THE SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, London, W.C.—Pamphlet entitled "The Story of a Dumb Salesman," which gives a description of the "Fortuna" shop window and counter advertising apparatus which they are placing upon the market. The device is an electrically-driven apparatus encased in a plated metal jacket and dome, around which the goods for exhibition are made to revolve without any visible means of suspension, whilst the external part of the apparatus is quite stationary.

MESSRS. RICHARD PAPE, LTD., Belvedere Works, Belvedere, Kent.—Two pamphlets; one of 12 pages relating to hand lamps, safety lamps and portable lighting sets fitted with "Fors" accumulators; the other (12 pages) being a catalogue of the "Fors" portable accumulators (ignition, car and carriage lighting, and yacht lighting).

THE PHŒNIX ELECTRIC HEATING CO., 17, Morwell Street, Tottenham Court Road, London, W.C.—Small hanging calendar with monthly tear-off slips, above which appears in colour a charming and peaceful country scene, entitled, "Where the Old Folks Live."

Trade Announcements.—MESSRS. ETCHELLS, CONGDON AND MUIR, LTD., engineers, 15, Cannel Street, Ancoats, Manchester, announce that owing to increase in the business carried on by them at 42, Deansgate, Manchester, they have consolidated their business with that of Messrs. J. C. Etchells & Co., Ltd., carried on under the management of Mr. J. C. Etchells at Cannel Street, Ancoats. The name of the company has been changed to Etchells, Congdon and Muir, Ltd., and the consolidated business will henceforth be carried on under the joint management of Mr. Etchells and Messrs. Congdon and Muir at the above address.

THE LUX CANDLE CO., LTD., have just removed their stores and offices to 36, Whitfield Street, Tottenham Court Road, W. (telephone, Gerrard, 3151). They will now be able to carry the much larger stock rendered necessary by the success of their metal-filament lamps.

By mutual arrangement MR. J. N. COOPER, A.M.I.E.E., is resigning at the end of the year his position as managing director of Messrs. Plutte, Scheele & Co., Ltd., of 18-19, Queenhithe, E.C., and Mr. Ernst Plutte has been appointed a director. Mr. Cooper is taking Mr. E. Roberts into partnership, and they will trade under the style of "Cooper & Roberts" as suppliers of electrical accessories, &c., merchants and agents, at 3, Paul's Bakehouse Court, Godliman Street, London, E.C.

We are informed that growth of business has compelled the ARMORDUCT MANUFACTURING CO., LTD., to make considerable extensions to their Witton Works. These extensions, when complete, will practically double the present capacity of the works.

THE BRITISH CENTRAL ELECTRICAL CO., 84, Hatton Garden, London, E.C., have been appointed sole agents for the Canfield insulating specialities, comprising special grades of friction tape and rubber splicing strip made by the Canfield Rubber Co., Bridgeport, Conn. U.S.A.

Tests of Metal-filament Lamps.—The following results of tests carried out on four Royal Ediswan metal (tungsten) filament lamps sent to a municipal supply station will be of interest, showing as they do that the claims made for these well-known lamps are borne out by the actual experience of users. The tests were made on four 100-volt 50-C.P. B.C. lamps, and the results were as follows:—1st lamp, life 8,000 hours, still burning; 2nd lamp, burnt out at 6,319 hours; 3rd lamp, burnt out at 6,783 hours; 4th lamp, burnt out at 6,319 hours. The average life for the three burnt-out lamps was, therefore, 6,474 hours.

LIGHTING and POWER NOTES.

Abingdon.—At a special meeting of the T.C. on Tuesday last week, the Mayor moved that application be made to the B. of T. on or before December 21st for a Provisional Order for the borough. On the Mayor undertaking to defray all future expenses connected with the Provisional Order in the event of the Council being unable to dispose of it; the resolution was carried by 7 votes to 3.

Axbridge.—The R.D.C. has referred to the Cheddar P.C. the application of the Wincombe E.L. Co. for permission to erect overhead lines for the supply of current in the parish. The R.D.C. favours the scheme.

Australia.—The controversy as to the electric supply of Leichhardt is stated to have been decided in favour of the Balmain Electric Lighting Co., the Sydney Council's tender having been rejected. The working of the Newcastle (N.S.W.) municipal electrical undertaking has shown a profit of £500 on the quarter's working. The undertaking has been in low water for some time.

Ayrshire.—The Northern District Committee had under consideration at its last meeting the formation of a special lighting district for Glengarnock. There was submitted a proposal from the Glengarnock Iron and Steel Co., by which it undertook to lay the cables, do all necessary work, including upkeep, and provide the current for the sum of £50 per annum for 10 years, at the end of which time the works would become the property of the District Committee. The meeting agreed to the company's proposal, and appointed a Committee to superintend the affairs of the new district.

Bexhill.—It was reported at the Council meeting on Monday that it would be necessary at an early date to construct an electrical sub-station to supply the Little Common district, and a Committee was appointed to consider the question of acquiring the site.

The De La Warr Estate has agreed to guarantee a revenue of 10 per cent. on the cost of extension of cable for a period of five years, in order to supply electrical energy for a pumping station to be erected for the Cooden Beach drainage scheme.

The number of new consumers connected this year exceeds last year's figures.

Barnsley.—It is proposed that a new railway siding should be constructed at the electricity works at an estimated cost of £870, and that application be made for sanction to borrow the money.

Blackpool.—The Electricity Committee has now accepted the tender of the Brush Co., for a new 800-KW. traction set; and that of the B.T.-H. Co. for a new 1,500-KW. steam turbo-alternator. Tenders for new condensing plant have been left over for future consideration.

Bolton.—The electrical engineer has been instructed to submit a report to the next meeting of the Electricity Committee upon the additional plant which, in his opinion, it will be necessary to put down in order to cope with the increasing demand for electricity.

Bradford.—The chairman and deputy-chairman of the Corporation Electricity Committee have been in consultation with the chairman and deputy-chairman of the Gas and Health Committees on the subject of a proposed smoke abatement exhibition, on lines similar to that held in Glasgow during the year 1910. The Committees have decided to recommend the holding of such an exhibition, and authorised the engineers to take all the necessary steps.

The Electricity Committee has approved the proposal of the chief engineer for the installation of air-filtration plant for the turbine-driven generators, at an estimated cost of £1,080, and a turbine-driven circulating pump (estimated cost, £700) in connection with the new turbo-generator. Application is to be made to the L.G.B. for sanction to borrow those sums.

Canada.—An Electrical Commission appointed by the municipal authorities of Montreal has reported in favour of placing underground the wires at present running overhead in that city. The drafting of the conduit plans, however, has to be carried out, not as a whole but in detail for different parts of the city. Accordingly, the Commission is preparing designs for placing underground the wires in a part of Catharine Street, about 2½ miles in length.

The establishment at Montreal of a company, with a capital of about £205,000 is announced, to carry on electric light, heat and power business.

The Imperial Trade Correspondent for Ontario reports the contemplated extensions of the hydro-electric system of a town in that province, at the estimated cost of about £227,800.—*Board of Trade Journal.*

Cardiff.—The City Council has decided to make application to the L.G.B. for sanction to borrow £10,500 for laying mains in connection with the electricity undertaking.

Chile.—The *Diario Oficial* reports that it is proposed to divide the Hydraulic Works Department into the following three sub-sections:—(1) Hydraulic surveys; (2) power stations; (3) conveyance of powerful electrical currents. It is also considered expedient to expropriate as soon as possible all those hydraulic works which it may be thought more suitable for the State to work

for its own account, and to encourage the development of other hydraulic undertakings by private enterprise in the most economic and efficient manner for the needs of the country. It is proposed, firstly, to investigate the requirements of the State railways, and to see what power would be necessary for those lines which the authorities contemplate electrifying. Examination will also be made as to the possibility of using hydro-electric power for military and naval arsenals. If the energy which it is practicable to generate exceeds the immediate requirements of the State, then it may be leased for private undertakings. The first programme will comprise investigations to be carried out during a period of five years relative to the rivers Aconcagua, Maipo, Cochapoal and Bio-Bio.—*Board of Trade Journal.*

Carnarvon.—The T.C. has decided to support the Bill of the National Electric Construction Co., Ltd., to confirm the agreement for free wiring.

Co. Durham.—The County of Durham Electric Power Supply Co. has applied to the B. of T. for permission to use extra-high-tension overhead lines for the supply of energy at a pressure of 20,000 volts between the Tudhoe Ironworks, Spennymoor, and Castle Eden. The lines will be in the areas of the Auckland, Sedgefield and Easington R.D.Cs.

Continental Notes.—AUSTRIA.—The wisdom of the construction of large electricity works for the service of extensive rural districts is, in certain responsible quarters in Austria, being called in question. In purely agricultural districts such concerns are only found profitable when industrial towns or regions are included in the area of supply. Small isolated plants may, however, confer considerable benefits on rural districts, and several examples are cited. One such is that erected at Mitteltal, in the Schwarzwald valley, a village of 300 inhabitants, which straggles for 3 km. along the banks of the Murg River. Here a modest plant has been set up which has given good results. The water from an old water-mill is led along a flume at the rate of 250 metres per second, and with a head of 2½ metres is used to drive a turbine producing 20 to 30 H.P. The electric lighting of the locality requires only 18 H.P.; the rest is available for the working of a flour mill and other purposes. The turbine drives by belt a 110-volt machine which charges a battery of 400 ampere-hours capacity with a 7½-hour load during the day. In the evening, battery and dynamo work in parallel at the network, and at night the battery covers the current requirements and the water-power is available for the mill. There is a total of nine 20-H.P. motors and 100 10-C.P. glow lamps connected. The cost of installation was 28,000 kronen. Interest and sinking fund are reckoned at 2,000 kronen. The lamps are estimated at 1·20 kronen per candle per year, or 0·60 kronen per KW.-hour for light, and 0·30 kronen for power. Receipts have totalled 4,500 kronen, leaving a considerable surplus.—*Elektrotechnik und Maschinenbau.*

The Province of Steiermark is the scene of considerable activity in the construction of hydro-electric generating stations at the present time. No fewer than five schemes are in hand. That to be built on the Drau River will yield 20,000 H.P., and is for the supply of light and power to the City of Marburg, the local authorities being the promoters of the scheme. The station projected on the River Mürz will necessitate the construction of a dam across that river, and is to be carried out by Messrs. Vogel & Noob, to supply power for their iron works situated at Wartberg. Official sanction has already been secured. The station contemplated on the River Mur is mainly a municipal project of the Town of Leoban, but large industrial concerns are interested. A similar undertaking is that contemplated at Rudersdorf, but a company is to be formed to carry out the scheme. Lastly, the Imperial Railway Department purpose constructing a large power station on the Lafnitz River near Beigürtl, the current to be used for the working of the Hartberg-Aspang Railway line. The Official Commission of Experts is now inspecting the sites, &c. —*Der Elektrotechniker.*

BELGIUM.—An important electric lighting and power transmission plant is about to be installed at the collieries of the Société des Charbonnages du Levant du Flenn, at Cuesmes. The generating plant will comprise a 1,600-H.P. steam turbine and a 1,250-KW. alternator and two smaller sets of 1,000-KW. capacity.

An electric lighting and power transmission plant is about to be put down at the quarries of the Société des Carrieres Dumont, at Valenciennes, near Tournai.

RUSSIA.—A proposal to establish a central electric lighting station in the town of Narwa is at present under consideration.

FRANCE.—A new company has just been formed at Monceau-sur-Oise (Aisne), with a capital of £30,000, and the title La Société de l'Energie Electrique du Nord l'Aisne, to acquire and carry on the undertaking of the Société de l'Energie Electrique de Monceau-sur-Oise.

SWEDEN.—The Municipality of Stockholm has now definitely settled the question of water power *versus* steam power for the production of the necessary electrical energy for light and power.

At the last meeting, on November 27th, a sum of £750,000 was voted for the erection of an electrical power station, from which the city is to be supplied with energy. This power station will be built at the Untraverkene, at the Datetven, which place is situated 82 miles from Stockholm. The waterfall in the Datetven, from which the power is going to be derived, was acquired by purchase about two years ago, at a price of about £111,000.

Croydon.—The B.C. has adopted the Electricity Committee's proposal to increase the output of the works by the installation of a 1,000-KW. mixed-flow steam turbine, driving a 750-1,000-KW. alternator, with an exciter and a 300-KW. direct-current machine, available either for traction or direct-current lighting supplies. This improvement, with certain necessary incidentals, was estimated to cost between £9,000 and £9,500. The borough electrical engineer calculates that the resultant saving will be £1,300 per annum, or over 14 per cent. on the capital outlay. According to the vice-chairman of the Committee, but for the coming of the metal-filament lamp, this expenditure would have been necessary years ago. Their load, he said, was on the up-grade again.

The B.C. has decided to pay at time and a-half all tramway employés working on Christmas Day; also to take advantage of a North-end widening to substitute a double tramway track for a portion of the interlacing lines rendered necessary in the first instance by the narrowness of the thoroughfare.

Edinburgh.—Since the introduction of electric lighting for common stairs, the arc-lamp trimmers have complained about their work being considerably increased, and in consequence the Corporation Electric Lighting Committee has agreed to put in clock switches, by which the lighting and extinguishing of the lamps will be done from the power station.

Glasgow.—Some time ago Mr. W. W. Lackie, the chief engineer of the electricity department, and Mr. S. Langlard, chief inspector of lighting, inaugurated, with the consent of the T.C., an experiment for improving the street lighting in the city. Two types of arc lamps were introduced—the Metroflam and the Angold; both have given every satisfaction, and it has been found that they could burn 80 hours with one trimming, and give three times more light for the same consumption of current as older lamps. Over 200 of the lamps are now in operation in several of the principal thoroughfares, and their numbers are being systematically augmented.

Great Harwood (near Blackburn).—The U.D.C. in Committee has passed a resolution that the scheme for the establishment of a generating station and the distribution of electricity within the urban district, prepared by Mr. J. W. Speight, electrical engineer, St. Annes, be approved, except such part as relates to the destruction of refuse, and that the estimated cost, amounting to £8,085, be also approved; and that the seal of the Council be affixed to a memorial to the B. of T. asking for a prov. order for the urban district.

Hastings.—This week the formal turning on of the light at the Union workhouse and infirmary buildings took place. The proposal to carry the mains a considerable distance in order to light the workhouse and pick up the borough sanatorium *en route* met with very strong opposition at the outset, and also on the occasion of the L.G.B. inquiry. One result of the extension of the mains will be the transference of the whole of the gas lamps on the route and the introduction of the electric light at several of the large residential properties in the St. Helen's district.

Keighley.—The Electricity Committee has recommended the T.C. to accept a tender for certain additional appliances at the electricity works, and to apply for borrowing powers to the extent of £6,576 for various purposes. In the T.C. the opinion was expressed that the expenditure on the electricity undertaking had been very heavy. The department had borrowing powers already to the extent of £75,146, apart from £9,300 for land, and it was necessary to provide over £3,700 a year for interest and sinking fund.

Lampeter.—The T.C. has granted Mr. Wm. Jones permission to fix overhead electric wires in the town for the purpose of supplying current to consumers.

Launceston.—The T.C. on Monday decided to inquire as to the cost of the installation for electric lighting for the Town Hall, Guildhall, and Free Library. The seal was placed to the supplementary agreement with the Launceston and District Electric Supply Co. for the payment of an annual acknowledgment of 6d. for each of the electric lighting poles in the borough, and the Council consented to the application proposed to be made by the company next session for a provisional order.

London.—BERMONDSEY.—The Electricity and Street Lighting Committee reports that since January 1st last it had connected to the Council's mains consumers with an applied demand of 570 KW., and negotiations were at present proceeding for another 288 KW. At the end of July last 101,096 more units had been generated than for the corresponding period of the previous year, being equal to an increase of 8 per cent. Owing to the late strike, however, all this lead had been lost, as the total units generated up to the end of November only amounted to 2,834,161 against 2,910,810 in the previous year. For the quarter ended December, 1910, owing to a breakdown of their own plant, Messrs. Spillers & Baker had taken 102,201 units from the undertaking. During the same quarter the Dock Co. and Messrs. Peek, Frean had taken 63,598 and 74,000 units respectively. Had it not been for the strike the Council's output would have shown an increase over last year, notwithstanding the loss of the above three consumers, whose demand amounted to 390 KW.

FULHAM.—The Public Heath Committee has decided, on the suggestion of the electrical engineer, to install transformers and metal-filament lamps in the Council's five public conveniences in lieu of the existing carbon-filament lamps, at a cost of £12. By thus doing it is estimated that in the first year a saving of £61 in the cost of lighting should be effected. The Electricity and Lighting Committee has decided to modify the existing charge under the

arc lamp rental scheme of £8 16s. per lamp per annum for a minimum consumption of 800 hours, with an additional charge of 2½d. per hour above the minimum number, to £5 10s. for 500 hours, with an additional charge of 2d. for every hour in excess of the 500. Alternatively, when preferred or required, agreements are to be entered into with consumers for a fixed charge per lamp per annum, such charge to be arrived at on the basis of the £5 10s. for a minimum of 500 hours and 2d. per hour afterwards, according to the total lighting hours per annum, calculated upon the recognised business hours of premises. The Committee has further decided to enter into a scheme similar to that in operation in Hammersmith for outside shop lighting, viz., to supply, fix and maintain one lantern for two, three or four lights, including wiring for same, at an annual charge of 16s. 9d., 20s. and 25s. respectively.

Lewisham.—The Board of Guardians has accepted an offer of the South Metropolitan Electric Light Co., at £10, to provide an installation for lighting the lunatic wards at the infirmary.

Marylebone.—Mr. A. H. Seabrook, general manager of the electricity undertaking, in a report thereon for the September quarter, states that the total increase in units sold amounted to 105,878, almost equally spread over the private supply and public lighting services. The income realised from the sales to private consumers, showed an advance of £417, which, including public lighting, showed a total increase of £907. The gross income from all sources was put at £30,332, as against £27,756 during the September quarter of last year, the major part of the advance being due to the extended operations of the sales branch. Mr. Seabrook further states that the total quantity estimated to be sold during the current year for both private and public supplies was put at 13,361,000 units, this being an increase of 8·3 per cent. on the actual sales in the previous year. In summing up for the six months ended September last, it was found that 4,438,020 units had been sold. This gave an increased sale of current for the past half-year of 344,649 units, equivalent to 8·4 per cent., compared with 8·3 per cent. the year's estimated increase.

Hampstead.—The B.C. sat in private and debated the question of the alleged excess of expenditure over estimates in connection with the recent conversion of the street lamps to electric lighting. It was found that 2,359 lamps had been converted, as against 2,229 which had been agreed on, and that the actual cost of the work amounted to £25,397, while the estimated cost was £15,072. The Sub-Committee which had been inquiring into the matter, reported that the estimates were prepared in a careless and slipshod manner, which amounted to culpability, by the assistant engineer, and that the chief engineer was to blame for not satisfying himself as to the accuracy of the statements he signed. In the result the Council dismissed the assistant engineer, and called on the chief engineer to resign, a course which he has since taken.

Norwich.—The Electricity Committee has recommended the T.C. to apply to the L.G.B. for a loan of £19,000 for mains and services, and for a turbine with two generators in tandem.

Nuneaton.—The T.C. has reduced the price of current for the Council offices and the depôt, from 4d. to 3d. per unit.

A loan of £7,200 for new plant and buildings at the electricity works has been applied for.

Portsmouth.—The T.C. has decided to support the Bill of the I.M.E.A.

Ramsbottom.—The U.D.C. has entered into an agreement with the Lancashire Electric Power Co. for the supply of electrical current at the sewage works.

Ramsgate.—The B. of T. has decided to have the Harbour clock lighted by electricity. Some years ago the lighting by gas was discontinued owing to the damage done to the works of the clock.

Rugeley.—On December 15th a meeting of ratepayers was held relative to the electric light question. The scheme submitted by Messrs. Drake & Gorham was estimated to cost £5,583, and it was estimated that the income during the first year would leave a surplus of £100. The meeting, by a large majority, empowered the U.D.C. to proceed with the matter.

Shanklin.—The U.D.C. has decided to enter into a fresh contract for public lighting for three years with the Isle of Wight E.L. Co.

Skegness.—The U.D.C. has decided to obtain expert opinion as to the cost, &c. of an E.L. undertaking.

South Africa.—The tender of the Cape Town Corporation has been accepted by the municipalities of Mowbray, Rondebosch and Claremont for the supply of energy to private consumers for a period of 10 years—also for the street lighting of the municipalities of Rondebosch and Claremont. This area has hitherto been electrically lighted by the Cape Peninsular Lighting Co., Ltd., whose headquarters are at Claremont. The basis of the tender for the supply to private consumers is to put them on the same terms as the Cape Town consumers with a maximum net rate of 9d. per unit for lighting, and 2½d. for power and heating; larger consumers will have the benefit of a sliding scale with increased discounts.

Stirlingshire.—The Bonnybridge Special Districts Sub-Committee reported to a meeting of the County Council that Mr. Churchward, general manager of the Scottish Central Power Co., agreed to give the necessary supply for the Greenhill district at the yearly rate of £2 5s. per lamp, providing all plant, maintaining, lighting and extinguishing the lamps, the contract to be for ten years, and the Road Board to give facilities for the erection of an overhead line. The offer was accepted, Mr. Churchward agreeing to proceed with the erection of the plant as early as possible. With regard to the lighting of High Bonnybridge, it was agreed to delay proceeding further in view of there being a possibility of the power company being able to give a supply for that part of the district also.

Sunderland.—At a meeting of the T.C. on the 13th inst. a report was submitted recommending that the Council contribute towards the expense of the promotion of the I.M.E.A. Bill. Ald. Bruce said the Bill would remove restrictions at present placed on municipal undertakings in regard to sales and wiring. They had already had two threats of injunctions to prevent them carrying on this work. He spoke of the advantage the Corporation had derived from the showroom and system of canvassers, and added that he did not think their guarantee would be for more than £50 or £60. The report was adopted.

Swansea.—The T.C. has decided to take no action with regard to the Bill of the I.M.E.A., as it already possesses some of the powers sought.

Swinton and Pendlebury.—The U.D.C. has decided to give a supply of current to the new schools at Cromwell Road and also to Messrs. Jones's foundry.

A suggestion that the Council should enter into a new agreement for a supply of current in bulk with the Lancashire Power Co., has been referred to a Committee, which was empowered to engage expert advice.

Tottenham.—A draft agreement between the Council and the North Metropolitan Electric Power Supply Co., has been approved providing for a penalty to be paid by the company to the Council of $\frac{9}{10}$d. per hour, or any part of an hour, in respect of which any arc lamps remain unlighted during the period they should be illuminated, subject to the penalty being applied to incandescent as well as arc lamps.

West Bromwich.—The T.C. has applied for a loan of £10,000 for the provision of additional generating plant.

Whitehaven.—The T.C. has under consideration a scheme for assisted wiring of consumers' premises.

The T.C. has decided to support the Bill of the I.M.EA., and to contribute up to £5 towards the cost.

Winchester.—The T.C. has decided that it cannot see its way to make any contribution towards the promotion of a Bill by the I.M.E.A. seeking to give local authorities powers to wire consumers' premises, and to supply fittings, &c.

Wombwell (near Barnsley).—The Electrical Distribution of Yorkshire, Ltd., has given formal notice to the U.D.C. of its proposed application to the B. of T. for a prov. order for the urban district.

Worcester.—The T.C. has applied for a loan of £7,250 for mains, meters and transformers for three years.

TRAMWAY and RAILWAY NOTES.

Australia.—The Perth (W.A.) Council has decided not to adopt the suggestion to promote a rival motor-'bus service in opposition to the tramways, but to continue negotiations with a view to purchasing the Tramway Co.'s undertaking.

Belfast.—At the fortnightly meeting of the Tramways and Electrical Committee on Monday, the general manager submitted a report on the question of the tramways extensions sanctioned by the new Act of Parliament, and it was arranged to deal with the matter at a special meeting. It was decided to have an alternate gas and electric lighting scheme at the Carlisle Circus for experimental purposes; it was also decided to lay mains to serve the Ulster Hospital for Women and Children at Templemore Avenue.

Bolton.—The question of extending the Corporation tramway system by linking it up with Westhoughton, which has no tramway facilities, is the subject of consideration between the T.C. and the Westhoughton Council. A deputation from the latter authority has attended before the Tramways Committee, and discussed the alternatives of an extension of the existing line from Bolton and the adoption of the railless system of traction. It was decided to have reports prepared by the officials with respect thereto. The Bolton tramway runs as far as Deane and Hulton in the Westhoughton district, leaving a gap of about 4 miles.

Bradford.—Proposals are on foot for extensions of electric tramways. The Tramways Committee has decided to ask the City Council to authorise the commencement of an extension of the track from Wyke to Bailiff Bridge, an addition of nearly two miles. On this route it is left open to future decision as to whether the service should be by the ordinary type of car or the railless system which has proved so successful in the cities of Leeds and Bradford.

The general manager has reported on the successful working of the new railless trolley system, and has been instructed to visit

the works of the Railless Electric Traction Co., at Chelmsford, to inspect the "Mercedes-Stoll" system. The general manager has also been authorised to proceed to Turin to inspect railless vehicles offered for sale by Dr. Zani, of Milan, and to visit Bremen to inspect the railless trolley system in operation there.

At the suggestion of the Amalgamated Association of Tramway and Vehicle Workers, the Corporation has decided that by way of experiment an electric tramcar be fitted with a vestibule front for protection of the driver in severe weather.

Cardigan Bay.—It is stated that a London syndicate has in hand a scheme for linking up by electric tramway the little towns of New Quay and Abergron, on the coast of Cardigan Bay. As pleasure resorts in the summer these places are yearly becoming more popular, but they are somewhat out of the way, and with the exception of the light railway, which is worked by the Great Western Co. from Lampeter to Abergron, there is no railway communication. A rough survey of the route has been made, and the installation of electric plant for lighting the towns and villages is said to form part of the scheme.

Edinburgh.—The T.C. has taken up consideration of the railless traction question again. The Tramways Committee at its next meeting will probably decide as to whether it shall adopt railless traction for all extensions or combine it with motor-'bus services for its requirements. The Town Clerk is to communicate with Leith Corporation to obtain its views as to a service plying on Easter Road either by railless traction or motor-'bus. The burgh engineer has been asked to report on a proposal to approach the Tramway Co. with a view to arranging for the running of double-decked cars to Georgie car terminus.

Glasgow.—Some interesting figures are provided by the tramways department in connection with the first week of the three months' experiment of doubling the ½d. journey for the same price. The experiment began on Sunday, December 10th, and the number of passengers carried for the seven days up till the evening of December 17th was 5,560,482, and the revenue was £17,595, against 5,039,307 passengers and £18,870 of revenue during the previous week, and against 4,528,789 passengers and £17,876 of revenue during the week ended Saturday, December 17th, 1910. These statistics show that last week there was an increase of 461,175 passengers, and a decrease of £1,275 in the drawings, compared with the previous week, and an increase of 971,693 passengers and a decrease of £281 in the drawings, compared with the corresponding week a year ago. A peculiar point, however, is that the drawings for Monday of this week (December 18th) were greater than they were for the Monday previous, and also for the corresponding day of last year, the total sum drawn on December 18th being £2,585, against £2,501 a week ago, and £2,583 last year. It is pointed out by the department that the pressure on the cars caused by the large increase in ½d. passengers and the difficulty of seeing that they do not over-travel their proper distances, have occasioned considerable harassment to the conductors, while it is also noted that several of the new stages give passengers practically a 1½-mile journey for ½d.

The Corporation has decided to delete from its general provisional order the proposal to link up the tramway route between Great Western Road and Gairbraid Street *via* a new bridge over the Kelvin.

The recently-reconstructed offices of the tramways department have already proved insufficient to accommodate the staff, and the Corporation has instructed the general manager to make arrangements for the tenants in the adjoining buildings, lately acquired by the T.C., vacating their premises for the purpose of immediate extension operations being begun.

The Tramway Committee, having taken back for reconsideration the proposals for the blind being permitted free travelling on the cars all over the system—reported in the REVIEW at the time—have now appointed a special committee to report to the T.C. what arrangements could be made so that all blind persons, properly authenticated, be given passes to permit them to travel free on the cars.

Lanark.—A special meeting of the County Council held last Friday, agreed by a large majority to promote a Provisional Order regarding tramways. The Council asks power to construct the lines of tramway left unfinished by the Lanarkshire Tramways Co., with certain additional small lengths of tramways which it is advised, fall naturally into the scheme. Power is also sought to enable the Council itself, or in conjunction with all, or any, of the Town Councils of the three burghs, who may so elect, to purchase the whole of the tramways.

Leeds.—Sir G. R. Askwith has forwarded his report on the matters in question at Leeds *re* the working hours of 54 per week for conductors and motormen. The arbitrator points out that the Corporation suggested, as a test, the average over the whole system, while the men suggested the average for the district routes. On both points Sir Geo. Askwith declares that he is not prepared to say that the average of 54 hours has not been as nearly as possible attained. Other matters are contained in the award which both sides have agreed to accept.

Sir Geo. Askwith's award also states that in Clause 7 the words "previous service to count" applied to car cleaners on the roster at the time of agreement. Those who had under 12 months' service were to receive 6d., those who had between one year's service and four years to receive 6½d., and after four years 6½d. In Clause 8, he considers that the rate of the employés mentioned in this clause should be fixed in accordance with the number of months they have been in the service. The decision was received with much concern by the employés, and arrangements are to be made to hold a meeting to consider the award, though it was recognised that the three years' agreement, entered into by the men's officials and the Corporation in August last, precludes the re-opening of the dispute.

Mossley.—On Monday, Mr. J. F. Price, coroner, held an inquiry into the tramway disaster which occurred October 20th, and which resulted in the death of six people. The driver of the car, Geo. Houchin, said the car went off like a shot from a gun. The wheels of the car did not revolve. The trolley came off and left the car in darkness. He could give no explanation of the cause of the accident. Mr. R. Blackmore, engineer-in-chief to the Joint Board, said he examined the overturned car and the route immediately after the accident. The only theory he could put forward for the accident was that the rear brake was not sufficiently released. This made skidding very much easier. The jury returned a verdict of "Accidental death," and added that no one was to blame. It recommended that a loop line be made at Abney Road, near the railway bridge, and was of opinion that if such a loop had been in existence the car would have taken it instead of going through the wall.

Rothwell (near Wakefield).—The Wakefield and District Tramway Co. having applied for permission to abandon the extension of the tramways to Oulton, the B. of T. has decided that it would be inexpedient to grant the application. The Board stated, however, that it would extend the time for a further 12 months, during which period it hoped the local authority and the company would consider whether it was possible to come to an arrangement whereby money for the extension could be provided, and the line worked on terms acceptable to both parties.

South Africa.—The Transvaal *Provincial Gazette* publishes an ordinance authorising the Germiston Municipal Council to raise a loan for tramways of £106,690.

Southampton.—The Tramways Committee has received a report from the manager to the effect that, owing to extra car-shed accommodation being provided, they would be able to build about 12 cars a year as against 6 at present, and asking permission to purchase the necessary timber for the proposed work. The Committee has decided to apply to the L.G.B. for sanction to borrow £7,200, the estimated cost of building 12 new cars. The advisability of extending the tramways to the various depôts of the works department is under the consideration of the borough engineer, the general manger, and the engineer of the tramways department is to report as to the probable cost.

U.S.A.—The Chicago Railways Co., which operates the street tramways in the city, has, during the past three years, added 11 extensions of its track. Since the reconstruction period began, 447 miles of track have been rebuilt, at a cost of $50,000 per mile, and the company will soon have 600 miles of track in use. It has 1,400 pay-as-you-enter cars on the road and an additional 215 cars are being built.

U.S. Single-phase Railway Operation.—The *Journal of Electricity, Power and Gas*, referring to the 11,000-volt single-phase line of the Spokane and Inland Railway (Washington), says it has been found in the winter, when steam trains operating paralleling routes to the single-phase are unable to get through without considerable delay, that single-phase trains run closely to their time schedules. The reason given is that on a single-phase road the voltage is so high, that it holds up to almost normal, even when the train motors are drawing very heavy currents. Our contemporary adds that with an ordinary 600-volt D.C. road when the cars must buck snow, the current consumption is so great that the line voltages usually drop to a value too low for effective operation. During the worst storms, with a foot or more of snow on the ground and from 6 to 10 ft. of it in cuttings, the Spokane and Inland trains were not more than 20 minutes behind time.

TELEGRAPH and TELEPHONE NOTES.

Cross-Channel Telephony.—Starting from Christmas Day, the facilities for telephonic communication between Great Britain and France will be greatly extended, thanks to the excellent results obtained from the new loaded cable laid by the British Post Office. The range will extend as far as from Aberdeen to Paris, a distance of about 780 miles, and some 300 towns in this country will be put into communication with Paris and many provincial towns in France. The rates from English towns will remain at 8s., those over the border paying 10s., but after an additional loaded cable has been laid by the French Government, enabling an increased traffic to be dealt with, it is expected that the rates will be reduced.

Earth Antennæ for Wireless Telegraphy.—Count Georg von Arco, in the course of a lecture delivered recently in Berlin, discussed the subject of wireless telegraphy. He is reported to have stated that the question had for a long time remained undecided whether the distant effects were caused through the air or the earth, or through both media simultaneously. During the course of years experts became more of the opinion that the earth was largely concerned with the transmission. In order to obtain information on the matter, systematic experiments had been made during the past two years by Dr. Kiebitz, on behalf of the German postal authorities. It was found in this connection that electrical energy was transmitted for considerable distances through the earth, and that in the case of great distances sufficient energy could even be taken from the earth alone for the purpose of reception. Stimulated by these results, the Gesellschaft für Drahtlose Telegraphie had made numerous experiments in the past year, and had applied for various improvements in patents. The effects of the earth antennæ were sharply directed, and the antennæ in many respects showed advantages over air antennæ. In particular it was possible considerably to increase the security against interruptions by atmospheric discharges and by stations causing disturbances.

Germany.—The telegraphs of the German Empire, according to the latest statistics, comprise 210,269 km. of wire, in addition to 48,171 km. of railway telegraph lines, and 6,293 km. of wire in the Colonies and China. The number of telegraph stations is 41,276 in the Empire, and 118 in the Colonies and China. There are 51,422 telegraph instruments, 13,035 of which are Morse or sounders, 1,204 Hughes, 33,746 telephone, 9 Baudot, 14 Wheatstone or recorders, and 9 Murray instruments.—*Deutsche Postzeitung.*

Rates on Telephone Property.—In reply to a question in Parliament, Mr. McKinnon Wood stated that there was no provision in any agreement with the National Telephone Co. whereby the company made themselves liable for any payment of rates beyond December 31st. From January 1st a contribution in lieu of rates would be made by the Government on the buildings and plant to be acquired from the company. Contributions in lieu of rates had been and were being paid in respect of the telephone trunk lines acquired from the National Telephone Co. in 1896; but no contributions were made in respect of trunk lines extended or erected by the Postmaster-General since that date.

Rural Telephone Installations.—Asked whether he had yet been able to establish any £3 telephone installations for the benefit of farmers and other rural residents, the Postmaster-General recently stated that the low rate of £3 a year for rural party lines was based on the assumption that an average of three subscribers per mile of route would be obtained. A large number of localities had now been actively canvassed, and it was clear that more than two subscribers per mile could not be hoped for except in a very few special cases. To meet this condition an increase in the charge would be necessary to cover only the direct cost of the lines and operating, without allowing anything for the general expenses of the exchanges with which the lines were connected, and he hoped shortly to be able to offer a modified scheme of rates to meet the same conditions in different localities.

U.S.A.—The Postal Telegraph Cable Co. has issued instructions to its construction department to proceed with the erection of additional heavy copper wires between all important points on the system of the company, for the purpose of extending the telephonic use of the same to the independent cable companies.

Wireless Telegraphy.—It is reported that experiments with high-speed telegraphy on the Poulsen system have taken place between the Cullercoats Station, near Newcastle-on-Tyne, and a Danish steamer at a distance of 496 miles. It is said to have been found possible to transmit up to 200 words per minute.

The stations at Ingö, in Norway, and in Spitzbergen, have been completed and tested. The results have been satisfactory, and on December 2nd a regular service was opened.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—N.S.W. Government Railways.—January 8th.—Four 1,000-kw. rotary converter units. January 22nd. Supply and erection at the White Bay power house, Sydney, of eight water-tube boilers, with superheaters, economisers and mechanical stokers. January 29th.—A 25-kw. booster set. Particulars, Electrical Engineer's Office, 61, Hunter Street, Sydney.

January 9th.—Accumulators, booster, switchboard and accessories, for the Subiaco Council. Town Clerk's office. Deposit of £100.

Melbourne.—January 9th. Three tons of bare hard-drawn copper cable, for the City Council. See "Official Notices" to-day.

Austria.—Lemberg.—January 10th. Tenders are invited by the State Railway Direction at Lemberg for the supply of a Diesel engine set of 400 h.p., for the railway power station; also light and power equipment of railway machine shop (switchgear, cable, three transformers for 5,000-volt three-phase current). Particulars supplied on receipt of postage by Bureau für Zugförderungsdienst, Lemberg.

Dartford.—January 23rd. One high-speed vertical uniflow engine, tandem generators and three-wire balancer, three superheaters and extensions to pipework, switchboard and electrically-driven centrifugal pump, for the U.D.C. See "Official Notices" December 15th.

Croydon.—January 5th. The County Borough invites tenders for two Lancashire boilers. Specifications and forms of tender, £1 1s. (returnable), from the Borough Engineer's office, Town Hall, Croydon.

Edinburgh.—The Governors of George Heriot's Trust invite tenders for the electric lighting and power installation in the science laboratories now under construction at George Heriot's School. Mr. John Anderson, superintendent of works, Heriot Trust offices, York Place, Edinburgh.

France.—January 5th. The French Post and Telegraph authorities in Paris are inviting tenders for a multiple telephone board for the Central Telephone Exchange.

Hornsey.—January 11th. One steam dynamo set (either reciprocating or turbine), for the T.C. See "Official Notices" December 8th.

London.—L.C.C.—The Main Drainage Committee is inviting tenders from six selected firms for the installation of electric light in the new engine-house at the Abbey Mills pumping station. The Highways Committee contemplates an expenditure of £4,000 on the renewal of the electrical installation in Blackwall Tunnel in 1912-13.

Hampstead.—The electrical engineer has been authorised to obtain meters and other stores at an estimated cost of £354.

Hammersmith.—It is recommended that the Council invite tenders for the supply of flame arc lamps in quantities of not less than 50 in one year, in connection with the proposed hiring-out scheme.

Manchester.—January 9th. (*a*) Steel girder tramway rails; (*b*) steel tie-bars for tramway rails. For (*a*) deposit of £1 1s. required. Specifications and forms of tender from Mr. J. M. McElroy, general manager.

New Zealand.—March 7th. Napier Corporation. (1) Permanent way, overhead work and supply mains; (2) power station, car-shed and repair-shop equipments; (3) rolling stock. Deposit 2½ per cent. Specifications can be seen at the Board of Trade Commercial Intelligence Branch in London.

Russia.—The municipal authorities of Woronege are about to invite tenders for the conversion of the horse tramway in the town to electric traction.

Siam.—December 30th. Tenders are invited for five electrically-driven centrifugal pumps for the waterworks at Bangkok. Particulars, Local Sanitary Department, Bangkok.

Bangkok.—March 15th. Tenders are invited for the supply and erection of an electric power station with a capacity of 3,000 kw. Tenders, on the prescribed forms, to the Ministry of Local Government, Bangkok. For further particulars see this column for November 24th.

Spain.—The municipal authorities of San Pedro (province of Albarete) have just invited tenders for the concession for the electric lighting of the town during a period of 20 years.

Swansea.—January 6th. Water-tube boilers, superheaters and mechanical stokers, for the Corporation Electricity Department. See "Official Notices" December 15th.

Turkey.—Tenders will be received at the "Ministère des Travaux Publics," Constantinople, up to 2 p.m. on February 20th, for a concession for the supply of electric light and power to the town of Adalia, which has a population of some 30,000. The supply of power for telegraph and telephone installations and electric traction is excluded from the concession. Power is to be generated from waterfalls. Tenderers must supply proof of technical and financial competency, and a deposit of £225 is required with each tender. Further particulars from the Commercial Intelligence Branch of the Board of Trade. Local representation is practically indispensable

West Hartlepool.—January 2nd. 191 tons steel rails, 3 tons fish plates, 11 pairs manganese cast-steel spring points (12 ft. long), 11 crossings, and reconstruction of tramway permanent way (Park route), for the T.C. Mr. N. F. Dennis, borough engineer (returnable deposit £1 1s. for each contract).

CLOSED.

Blackpool.—The Tramways and Electricity Committee of the T.C. has accepted the tender of the British Electrical Engineering Co., Ltd., for an 800-kw. traction set, and that of the British Thomson-Houston Co., Ltd., for a 1,500-kw. steam turb alternator.

Bournemouth.—The T.C. has accepted the tender of Messrs. Goddard, Massey & Warner for rebuilding six new cells at the refuse destructor, at £1,450.

Bradford.—The Corporation has been recommended to accept the tender of the Brush Electrical Engineering Co., for the supply to the Tramways Department of six new car trucks, at £39 10s. each.

The Corporation has been recommended to accept the tender of Messrs. J. J. Griffin & Co., for the provision for the Technical College, of six electric pyrometers, arranged with the necessary switches for coupling to one direct reading instrument, at £26.

Bury.—The T.C. has accepted the tender of the British Westinghouse and Manufacturing Co., Ltd., for two 750-KW. rotatory transformers.

Crewe.—The Cheshire Education Committee has accepted the tender of Messrs. Carrington & Button, of Crewe, for electric light fittings for the new College at Crewe, at £135.

Dundalk.—Messrs. Siemens Bros. inform us that they are supplying the whole of the street-lighting material, comprising standards, cast-iron brackets, lanterns and "Onewatt" lamps, for the new street-lighting scheme which is now being carried out here.

Glasgow.—The T.C.'s Parks Committee has accepted the offer of the Electricity Department for the erection, round Richmond Park pond, of ten electric arc lamps, with overhead wires, for the lighting of the pond during skating, for a sum not exceeding £72. The Tramways Committee has accepted the following offers :—

Commutators for W.H. 49B motors.—Alfred Clare & Co.
One 40-B.H.P. compound-wound motor.—Mavor & Coulson, Ltd.
Upkeep of stokers at Pinkston.—Babcock & Wilcox, Ltd.
V.I.R. cables.—W. T. Glover & Co., Ltd.

Government Contracts.—The following tenders have been accepted during the past month by the Government Departments named :—

War Office.

Switchboard and balancer in connection with the Bordon electricity supply.—Evered & Co., Ltd.
Telephone sets, &c.—British Insulated and Helsby Cables, Ltd.; Midland Electric Wire Co., Ltd.; Spagnoletti, Ltd.; West London Scientific Apparatus Co., Ltd.
Installation of electric light in Quebec Barracks, Bordon.—J. B. Saunders and Co., Ltd.

India Office Store Department.

Accumulators, &c.—Rice & Co.
Cells.—Siemens Bros. & Co.

Office of Works.

Electric lamps.—British Thomson-Houston Co., Ltd.; Edison & Swan United Electric Light Co., Ltd.; Foster Engineering Co., Ltd.; Omega Electric Lamp Co., Ltd.; Pope's Electric Lamp Co., Ltd.; The "Z" Electric Lamp Manufacturing Co., Ltd.
Electric lift at old building of the Imperial College of Science.—Otis Elevator Co., Ltd.
Collapsible lift gates, &c., Royal Courts of Justice.—Waygood & Co., Ltd.

General Post Office.—Telephonic apparatus.

Bell sets.—British Insulated and Helsby Cables, Ltd.
Silence cabinets.—M. Hunter & Sons; King & Scarborough.
Cases for retardation coils and condensers.—British L. M. Ericsson Manufacturing Co., Ltd.
Flexible cords.—London Electric Wire Co., Ltd., and Smiths, Ltd.
Plugs.—British L. M. Ericsson Manfg. Co., Ltd.
Switchboards.—British Insulated and Helsby Cables, Ltd.; British L. M. Ericsson Manfg. Co., Ltd.; Western Electric Co., Ltd.
I.-R. and C.C. cable.—British Insulated and Helsby Cables, Ltd.; Siemens Bros. & Co., Ltd.
Paper-core cable.—British Insulated and Helsby Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Fuses.—British Insulated and Helsby Cables, Ltd.
Insulators.—Bullers, Ltd.; Doulton & Co., Ltd.; Taylor, Tunnicliff and Co., Ltd.
Keyboard perforators.—Gell Telephonic Appliances Syndicate, Ltd.
Automatic exchange equipment at G.P.O. (West), E.C.—British Insulated and Helsby Cables, Ltd.
Gamewell fire-alarm system at Hampton Court Palace.—G. Longfield Beasley.

Keighley.—The Electricity Committee has accepted the tender of Messrs. E. Green & Son, at £182, for an additional section to existing economisers in connection with the water-tube boilers.

London.—The Korfund Co., of Westminster, have just received an order for the insulation, with "Korfund" patent cork resilient foundation plates, of the foundations of two 90-H.P. Diesel engines at Berner's Hotel, Berner Street, W.

Margate.—The T.C. received the following tenders for an eight-cell refuse destructor :—

Manlove, Alliott & Co., Ltd. .. .. .. (accepted)	£11,403
Goddard, Massey & Warner	9,325
Hughes & Stirling	9,954
Heenan & Froude	11,304
Horsfall Destructor Co.	11,430

Nuneaton.—The T.C. has accepted the tender of the Electrical Co., Ltd., for the maintenance of the public street lamps, at £35 per annum.

Perth.—The T.C. recently advertised for offers to supply electrical capstans for railway shunting work at the Corporation gas works. At a Council meeting held on 11th inst., it was unanimously agreed to accept the offer for the supply of Liddle patent capstans, Edinburgh. This is the third occasion within a very short time on which the Corporation gas works have adopted this patent capstan.

Southampton.—The tender of Messrs. Walter Scott and Co. has been accepted by the T.C. for the supply of 100 tons of tramway rails and 20 tons of curved rails.

Stafford.—The T.C. has accepted the tender of the Electric Construction Co., of Wolverhampton, for a booster and switchboard.

Walsall.—The following tenders have been accepted by the T.C. for the annual supply of stores to the tramway department :—

A. Womersley & Son.—Motor grease and lubricating oil.
W. H. Keys, Ltd.—Creosote, oil and pitch.
Le Carbone.—Carbon brushes.
A. G. Engholm.—P. & B. insulating paint.
Estler Bros.—Section insulators.
Electric and Ordnance Accessories Co.—Arc lamp globes and carbons.
Hoffmann Manfg. Co., Ltd.—Ball-races.
British Insulated and Helsby Cables, Ltd.—Mechanical ears.
Dyer & Young.—Armature coils.
Edison & Swan United Electric Light Co., Ltd.—Lamps.
Watlington & Co., Ltd.—P. & B. tape and Blackley tape.
National Rail and Tramway Appliances Co., Ltd.—Brake blocks.
British Hele-Shaw Patent Clutch Co., Ltd.—G.E. 58 pinion wheels.
A. Wiseman, Ltd.—Gear wheels.
Anti-attrition Metal Co., Ltd.—Trolley wheels.
Pinchin, Johnson & Co., Ltd.—Air-drying Voltalac.
British Thomson-Houston Co., Ltd.—Gear cases and controller fingers.

The T.C. has further accepted the tender of Callender's Cable and Construction Co., Ltd., at £46 15s., for laying low-tension cables to connect the new exciter with the low-tension switchboard at the generating station; and that of Messrs. Joseph Parker & Sons, at £28, for a 10-cwt. lorry for the tramways department.

Widnes.—The T.C. has accepted the tender of the Commercial Cars, Ltd., for two single-deck 'buses to carry 34 passengers each.

NOTES.

"A Merry Christmas."—The Editors of the Electrical Review wish all of their readers and supporters a Merry Christmas and a Prosperous New Year. 1911 will be remembered by all connected with the electrical industry as a year of great activity in which the Olympia Electrical Exhibition, and the electrical illumination features of the Coronation celebrations, called for additional concentration and entailed considerable strain. In many cases the summer vacation was spoiled by both events. With these recollections, and with the knowledge that the electrical industry is gradually improving, indeed in some parts of the country is now enjoying a record turnover, the brief Christmas respite can be entered upon with satisfaction. The few days of Christmas spent in joviality and rest in the family or social circle, should impart new energy, making all classes ready for a renewal of busy times in the early days of 1912.

Indian Business Methods.—Having read with amusement the letter published in a recent issue, the Silent Electric Clock Co. send us a similar one, which they received a few months ago—perhaps from the same source :—

"Please send us by return mail your very latest illustrated price lists of all your specialities, and quote us only your lowest rock-bottom wholesale trade prices. Kindly also be sure to add that you will allow us very tempting trade discount, together with 5 per cent. cash discount; you will please state only your highest possible trade discount. India is a most miserably cheap market, so quote lowest prices and highest discounts. If you only abide by this request we shall do a tremendous trade with you, should we find your specialities quick selling lines. We have electric lights and electric fans in our premises, but please inform if your electric clocks can be introduced in districts where there is no electric installation at all. Finally send us full details and particulars of all your specialities. Do not quote prohibitive prices, and do not quote paltry discounts, else business will be out of the question.

"We established over 15 years back with merely 4s. 6d. To-day we supply to over 5,500 customers every month, and in Bombay alone. Moreover, we have quite an army of customers all over India, Burmah, Ceylon, China and Japan. Therefore, it will be for your own benefit to quote us cheapest prices and largests discounts; remember :—

'He that will not when he may,
He shall not when he will.'

"We trust this small hint will be quite enough for you.

"While replying, please state that no charge will be made for packing or for wooden cases. Kindly also inform if you will pay freight and duty to India or not, and if you will appoint us your exclusive representatives and sole agents in all the East, or a specific portion thereof or not.

"Trusting this will result in good trade connections between us.—Yours faithfully, &c"

The Copper Market.—A correspondent writing in the *Financier* of December 12th states that the price of standard copper shows a tendency towards a slight rise, consequent upon purchases, mainly of a speculative character. He thinks that this cannot be altogether taken as an indication that the *bonâ fide* demand is not so strong as usual, but that it is due in a large measure to the usual slowing-down of the metal market consequent on the approach of the Christmas holidays, and for this reason the temporary falling-off in consumption is likely to be even more noticeable. The writer states that there is also at present a strongly-marked bullish movement ostensibly supported by the monthly American statistics. He is also of the opinion that, regarded from the buyers' point of view, the latest figures are certainly encouraging, and that at first sight the result might be expected to take the form of higher quotations consequent upon the lower production and decreasing stocks of copper.

The *Financial News* of December 8th gives an extract from a report of the Copper Producers' Association, stating that the copper (metal) output for November was 49,945 tons, the domestic consumption 30,375 tons and the exports 29,932 tons, leaving surplus supplies of 49,904 tons at the end of November, as compared with 60,300 tons at the end of October. The stocks of metal for November for the last two years were given as 58,209 and 54,520 tons respectively. The production for November, 1911, is given as 53,282 tons, so that from both points of view, the statistical position, on the strength of this statement, is decidedly better. The writer of the article goes on to state that the general feeling among London brokers during the past four or five months has been that the American figures have not been so reliable of late as hitherto, and that it is held by those whose information is usually correct, that the U.S. copper output during the past four months has been considerably greater than would appear to be the case, judged from the American figures, but that for some considerable time at any rate there can be no means of officially checking the figures, and that in any case it is a doubtful question whether the Washington authorities would ever be able to get at the true state of affairs.

In another part of the same article the *Financier* correspondent expresses the opinion that any effective combination among copper producers has been rendered impracticable owing to the generally prevalent feeling of uncertainty as to the attitude of the American Government and Courts on the question of trusts, and the results likely to accrue therefrom—since it is recognised that under ordinary circumstances, such a combination would be very difficult to organise on a sound basis, but when, in addition to this, the present uncertainty prevails, it is considered far too risky to attempt the project at all. The writer states that it is generally understood that the American copper market is, for this reason, quite free from any controlling influence over its prices. Whether this state of affairs has any connection with the policy of concealment adopted by the Copper Producers' Association it is difficult to say, but when an industry is in such a position that it is thought desirable to withhold its production figures, it is a matter of little difficulty for an association, which otherwise has little justification for its existence, to manipulate the figures as required.

The visible European supply (excluding Germany and Holland) at the end of November was stated to 58,682 tons, as against 86,250 in November, 1910. The world's visible supply (excluding Germany and Holland) is computed at 108,586 tons, as compared with 14,459 tons last November. The stocks at Rotterdam and Hamburg are not at present available, but for November of this year they are computed at 17,100 tons, which is probably slightly lower than those of the corresponding date last year. There is no doubt, however, that the trade both in Europe and America has been quite healthy lately, and is steadily increasing. The author of the article continues by saying that American manufacturers are steadily buying, and it is expected that this activity will continue for some time as a result of the contemplated extensions and developments of railways, public works, &c., and the opinion is expressed that this state of affairs lends additional colour to the view that the American copper output is larger than would appear to be the case according to the published statistics. It is maintained that the temptation to manufacturers to increase their output on account of rising prices, an increasing demand and decreased stock must be irresistible to many mines at least. Furthermore, he considers it fairly safe to assume that if copper quotations show any further permanent and substantial rise, the producers will certainly increase their production *pro rata*. It is generally thought that, judging from the state of affairs all over the world, any such rise in quotations would be due rather to speculative buying than to the coincidence of supply and demand in the way of trade. It is, however, fairly evident that the period of unwieldy stock and stagnation has passed, for a time at any rate, and that there is every indication of sound business being done. It is a notable fact, according to the article, that the London holders of standard copper are holding their stocks strongly and seem by no means anxious to sell.

Electricity in Horticulture.—At the Highfield Nurseries, Billericay, electrical apparatus patented by Mr. T. Clark, of Bristol, has been installed in connection with a new glass-house 200 ft. in length, for the "intensified" cultivation of tomatoes, cucumbers and strawberries. An influence machine is used to supply static electricity to 1,000 ft. of wire suspended overhead in the glass-house.

The B.T.-H. Busy.—On a recent visit to Rugby we took the opportunity of having a run through the British Thomson-Houston Co.'s shops, and found them full to the doors with work. The horizontal Curtis turbo-generator has become very popular, and cannot be turned out quickly enough to meet the demand; sets of all sizes were going through the works, including two of 5,000-KW. output each. It is interesting to note that the pure Curtis turbine—perhaps the simplest type made for large powers—has been so well received in this country, though doubtless the fact that the vertical type has practically given place to the horizontal type represents the pressure of public engineering opinion or mere "fashion" in favour of the latter. In the United States, on the other hand, vertical Curtis turbines of 20,000 KW. are being installed, and the vertical type seems to have firmly established itself there. The very small floor space occupied by the Curtis turbine, even of the horizontal pattern, and the shortness of the rotor shaft, as well as the large clearances permissible and consequent freedom from stripping, are, no doubt, strong points in its favour, and when combined with its simplicity and lower cost, compensate for any small deficiency in economy.

One of the 5,000-KW. sets was on the testing bed at the time of our visit, and appeared to occupy no more floor space than a 500-KW. high-speed reciprocating set of the type that was standard but a few years ago, besides requiring far less head room.

The works have already been extended as far as possible under the present conditions; the testing and erecting shops have been greatly increased in capacity, but, nevertheless, the work has encroached upon other departments, and the coil-winding department in particular has overflowed into every available corner. In default of further space on the ground floor, the winding department is being extended skywards, a building of several storeys being in course of erection for this purpose; a new foundry is also being built, and when this is ready the present brass foundry will be removed, and new machine shops will be erected on the site thus rendered vacant.

The meter and instrument department is also full of work, and additional accommodation has had to be provided to cope with it. We may add that the engineering works at Rugby are running night and day.

Surely, under such conditions, and assuming that other works are satisfactorily employed—as we know many of them are—the time is ripe for that advance in prices which is so urgently required to enable our manufacturers to derive a reasonable return from their heavy investments. Hitherto the customer has had all the luck—he cannot logically complain if the producer claims a share in the fruits of his labour.

Ironmongers and Electric Lamps.—In our issue of December 1st, there appeared an article by Mr. H. E. Goody on "Ironmongers and the Sale of Electric Lamps." The author's comments have been criticised in some of our contemporaries, among them being the *Ironmonger*. We reproduce from the "Electrical Notes" appearing in the last issue of that journal the following observations, showing the ironmongers' views on the matter:—

"A writer in the ELECTRICAL REVIEW draws attention to the alleged straits of the local wiring contractor, and seeks to establish a claim that lamps should be purchased from tradesmen with electrical training, and not from ironmongers. The article in which this claim is made does not disclose an undue familiarity on the part of the author with the nature of the ironmongery business, and the calling of an ironmonger is one which the author apparently does not associate either with dignity or with technical competence. The expansion of the electrical industry is so comparatively modern that one might suppose that there has been no time for anyone connected with it to hold antiquated ideas. However, the writer of the article referred to proves that such a thing is possible. No useful purpose would be served by answering his two columns of misrepresentation, upon which no manufacturer or supply undertaking would for one moment rely. Arguing on a point of dignity against the absorption of the electric lamp business by ironmongers, he complains that 'the incandescent electric lamp, the complexity and technical mystery of whose manufacturing processes should have saved it from this final disgrace, has become part of a stock-in-trade which includes putty and French nails.' But the chief argument used against the supply of lamps by ironmongers is that they cannot be safely trusted to sell in any given case the right sort and size of lamp. The ironmonger, it is stated, sells a thousand things of common every-day use about which no inquiry of a technical nature is even remotely necessary; and it is not considered likely that the assistant 'who has just been doling out tin-tacks or dresser hooks in an entirely confident manner, free from all qualms or questionings, and who has probably never seen an electric lamp out of its wrapper, will be a trustworthy salesman of the last commodity.' A person who writes in this way at once shows his unfitness for the task which he has undertaken, and displays lamentable ignorance of the training and technical experience of ironmongers. The type of ironmonger which is now common is that of a man of sound technical competence and business stability who can be replied upon to carry out efficiently work entrusted to him. Thus it would not only be futile to eliminate such a man, but it would be inexpedient. It is distinctly beneficial that lamps should be generally regarded as commonplace commercial articles, like gas mantles, and made a prominent feature of shop-window displays. There are still many thousands of houses to be wired, and the local contractor cannot rely upon his supposed training to give him a monopoly in lamps."

The Lighting of London Entertainment Houses.—Including London, there are 2,900 permanent entertainment houses in the kingdom open every night. They include 300 theatres, 800 music halls and picture palaces where variety artistes are engaged, and 1,800 picturedromes; 400 of them light entirely with gas; the balance have electrical installations. 500 run their own plants. They light 375,000 incandescents and 10,000 arcs nightly

Publicity Literature.—There have been many attempts made, in the course of our experience, to issue electricity supply publicity magazines. In respect to at least three that we can remember by name, they have had their day and ceased to be. We need not speculate as to the reasons. They were very creditable productions in their way, and it may be that here and there they furnished for the use of the hesitating public an argument which clinched the matter and added a new consumer to the electric light and power mains. There are others still existing which are edited by those who have had experience concerning what is useful and convincing information and what is not. There is now being brought out a small publication of a slightly different kind, known as the *Journal of the Electric Supply Publicity Committee*, of which No. 1 (December) now lies before us. We have never been favourably impressed with the wisdom of electric supply authorities publishing journals by the aid of the advertisements of manufacturers who looked for business from those authorities. This new paper is not intended to reach the public; it is a piece of publicity effort about publicity. Its object is stated to be to furnish the supply industry with a means for "ascertaining the views and opinions of subscribers and promoting free discussion on any topics of general interest." We are told in the opening notes that it "will not be *merely* another addition to the already overloaded list of technical papers"—then it is admitted that it will be that?—but it will confine its attention wholly to the commercial side of the industry, and will be essentially a journal "written by commercial managers for commercial managers." As the organ of the Publicity Committee, "it will strongly advocate the cultivation of publicity by co-operative effort," but at present it will only exercise this strong advocacy once a quarter, so that the interchange of ideas regarding an article appearing in, say, December, will take place next March. There are several articles in this first number; one on the work of the Electric Supply Publicity Committee, by Mr. H. B. Renwick, its chairman; and a brief contribution on the Olympia Electrical Exhibition, by Mr. F. J. Walker. The latter author says that trade shows are of little use to electricity supply companies, and he tells the management of the Olympia Exhibition "that the management and scope of the Exhibition were not directed on the most favourable lines." If he had admitted that the exhibit of the supply companies was "not directed on the most favourable lines," we should have been more ready to agree with him. What Mr. Walker wants for the supply concerns is a "really popular Exhibition which amuses and interests." He forgets that the space taken by his authorities might have been so used, and the popular show have been impressively organised as a part of the whole. It is one of the objects of the new paper to advocate co-operation in publicity. If there was one thing more than another which impressed us at Olympia, it was the utter want of efficient co-operative organisation of the supply companies' exhibit. Mr. Seabrook has a short contribution on "Powder and Shot," and Mr. A. F. Harrison one on "Electric Cooking." It may be thought that we are prejudiced critics both of the idea and of the journal, but anybody who sees this first number will understand that that, at any rate, could hardly be. Nevertheless, we say frankly that we do not for a moment see that this *Journal* is going to provide any *additional* facility for the interchange of ideas, seeing that the existing electrical publications have for years shown that they regard this as one of the subjects in which their readers are interested. Indeed, we are inclined to think that it may happen that some ideas of value may occasionally be lost in these quarterly publications which, if they appeared in the weekly and widely circulated papers, might have a much larger circle of readers directly and indirectly interested in the progress of electricity supply. The work of the Publicity Committee has never received much praise, so far as we are aware, if it has merited it; whether this *Journal* will have a better experience time will prove.

Royal Society Medal.—The Hughes Medal of the Royal Society has been awarded to Mr. C. T. R. Wilson, F.R.S., in recognition of the great value of his researches in connection with the ionisation of gases.

The Municipal Tramways Association (Inc.).—Presentation to Mr. A. R. Fearnley.—The first annual general meeting of the Incorporated Association was held at the Town Hall, Sheffield, on the 15th inst. Mr. H. E. Blain (West Ham) the president of the Association, was in the chair.

The members of the Association took the opportunity of marking their appreciation of the services which Mr. A. R. Fearnley, general manager of the Sheffield Corporation Tramways, has rendered to the cause of municipal tramways during the five years he has held the office of hon. secretary and treasurer of the Municipal Tramways Association, which he recently resigned, he having been selected as vice-president. The presentation took the form of a handsome inlaid writing bureau, set of bookcases, bronze electric lamp, and a necklet for Mrs. Fearnley.

The President alluded to the growth of the Association and of municipal tramway undertakings during Mr. Fearnley's period of office. One of the greatest achievements of the Association during his secretaryship was the compilation of the exhaustive report on tramcar brakes, which, from the point of view of public safety as well as their own interest, was one of the most important works ever undertaken, and in which Mr. Fearnley took a very important part. The investigation of corrugation of tramway rails, negotiations with the Government, the Post Office, and Parliamentary work, were alluded to by the President as being important matters in which Mr. Fearnley had rendered valuable assistance.

The Lord Mayor of Sheffield (Councillor A. J. Hobson) in heartily associating himself with the references to Mr. Fearnley's capabilities, said perhaps the best testimony he could give was that throughout his long public and business career in the city he had never heard one word of complaint against the Sheffield Tramways undertaking. He was followed by Sir William Clegg (chairman of the Sheffield Tramways Committee) and others.

Mr. Fearnley, in acknowledging his appreciation of the gifts, alluded to the increasing activities and responsibilities of the Association. Municipalities were now responsible for two-thirds of the total capital expenditure on tramways in the country, and they were still spending money at the rate of two millions per annum. There were considerable extensions taking place at the present time. The largest private tramway concern in the country had just handed over its best lines to the second largest municipality in the kingdom, and was offering to sell the remainder of its undertaking before the expiration of the lease. Another large undertaking was negotiating for transfer to the London County Council, and in a couple of years the only remaining provincial company of any note would hand over its undertaking to the Bristol Corporation. In a very short time all the leading undertakings would be in the hands of the municipalities, and it was admitted that English municipal management could "give points" to the Americans. They had to-day no difficulty with the Board of Trade, and the only department from which they might expect a more reasonable attitude was the G.P.O. The problem of the congestion of traffic in city streets was one of increasing anxiety, and in the matter of fares, the action of the Glasgow Corporation in effecting such sweeping reductions as to provide a ride of a mile and a half for ½d. was likely to result in changes of tramway finance of far-reaching effect.

The International Smoke Abatement Exhibition.—We are informed that considerable progress is being made with the arrangements for the International Smoke Abatement Exhibition which is to be held at the Royal Agricultural Hall, London, from March 25th to April 4th, 1912. The Exhibition, of which the Duke of Argyll is President, is being organised under the direct auspices and supervision of the Coal Smoke Abatement Society. In addition to that Society, however, a number of distinguised bodies have extended to the Exhibition their hearty support. Electrical interests are well represented in this way, as the patrons include the Institution of Electrical Engineers—which has nominated one of its Vice-Presidents, Mr. W. H. Patchell, to the Exhibition Council—the British Electrical and Allied Manufacturers' Association, with its secretary, Mr. D. N. Dunlop, on the Council, and the Conference of chief officials of London Electric Supply Companies, represented by its chairman, Mr. Frank Bailey (joint managing director of the City of London Electric Lighting Co., Ltd.), and hon. secretary, Mr. F. J. Walker (general manager of the St. James' and Pall Mall Electric Light Co., Ltd.). Sir William Preece and Sir Oliver Lodge are Vice-Presidents of the Exhibition, and prominent members of the Advisory Council include Mr. Sydney W. Baynes (chief electrical engineer, St. Pancras Borough Council), Mr. Sydney T. Dobson (chief engineer, St. James' and Pall Mall Electric Light Co., Ltd.), Mr. R. S. Erskine (Kensington and Knightsbridge Electric Light Co., Ltd.), Mr. Claude W. Hill, Prof. Andrew Jamieson, Mr. E. L. Joseph (Ozonair, Ltd.), and Mr. J. B. Simpson (chairman, Waste Heat and Gas Electrical Generating Stations, Ltd.). Representative sub-committees, chosen from the gentlemen named, have been appointed and meet frequently to deal with the organisation of a comprehensive exhibit to demonstrate the uses of electricity for lighting, heating and other domestic purposes, as well as for commercial and motive power purposes. A block with a minimum area of 1,280 ft. super, situate near the centre of the Hall, has been reserved for this exhibit, and there will also be other shows by individual concerns. A number of the firms constituting the Manufacturers' Association are stated to be taking up the matter with enthusiasm. Conferences and lectures will be held in connection with the Exhibition, and they will be attended by delegates from all the great municipalities and from the various learned societies interested in lighting, heating or power development and distribution. Mr. Bailey has undertaken to give an illustrated lecture with special reference to electricity. A considerable proportion of the available space has been already applied for. The organising manager is Mr. F. W. Bridges, of 119, Finsbury Pavement, E.C.

Hiring Out Vacuum Cleaners.—In the *Ironmonger's Weekly* there appears a spirited attack on the Stockport Corporation Electricity Committee for hiring out vacuum cleaners. We quote:—

"It has been left to the Stockport Corporation Electricity Committee to descend to the meanest of all subterfuges yet adopted for filching trade which, we say unhesitatingly, belongs to the retail trader and the retail trader alone. We should like to be quite certain that the business men composing the Stockport Corporation really know what the Electricity Committee are doing in their name, and we should also like to know how that Committee justify their action in hiring out vacuum cleaners, which, so far as we can see, have no connection with electricity supply. Possibly the vacuum cleaners in question are worked by a small electrical motor; we cannot say. We simply have it before us that the Committee are hiring out vacuum cleaners, and note that, very rightly, the Stockport and District Ironmongers' Association has passed a resolution protesting against such an action.

"What is the attitude of the Stockport Council in reference to the deluded individuals called retail traders, who cheerfully (or otherwise) obey the demands, reasonable or otherwise, of that body in regard to the payment of rates? If traders are taxed, and we have never heard them complain that they were let off lightly, surely

they have a right to trade? We hear a great deal about taxation and representation, but it seems to us that the great question of the day is, taxation and the rights it should confer. We know the necessity of taxation, but surely, if a governing body tax a tradesman, they incur certain responsibilities in regard to him? For what does he pay his taxes? He pays them for his shop, and heavily are shops rated, too. The purpose of a shop is that the proprietor may trade therein. By the payment of his tax, the shopkeeper obtains a vested right in the trade to be done in that shop. He grumbles, and rightly so, if his landlord allows a competitor to open next door. Most landlords recognise their responsibility in this direction. The governing body is a kind of landlord in respect of the taxes it levies. Why, then, should it seek to obtain dues from him, and then proceed to hinder him from doing the trade, without which he cannot hope to meet those dues?

"The time has come when retail traders must insist upon this matter being fought out. The shopkeeping fraternity must make a dead set against all candidates who take part in the administration of Committees which engage in trading operations. That is the only way in which they can hit back. There must be no question of party politics with them; they must vote for the maintenance of their trading rights. Let them once show that they can hit back, and the blows dealt at them will at once be lessened in force and frequency."

Parliamentary.—GALWAY TRAMWAYS.—Mr. Stephen Gwynn asked the President of the Board of Trade whether in 1877 a sum of £300 was deposited in respect of the Galway and Salthill Tramways Act of that year; whether this sum had been retained ever since, and was now in the Court of Chancery; and whether, since the company had been and was now working to the satisfaction of the public, the money might be refunded to the company. Mr. Robertson said the conditions prescribed by the Act for the release of this deposit on a certificate by the Board of Trade were not complied with. The sum in question was, he understood, still lying in the Court of Chancery, and he was informed that there was no power to release it, except upon an order of the Court.

NATIONAL INSURANCE BILL.—Mr. Clynes asked whether the attention of the Chancellor of the Exchequer had been drawn to a circular issued to employés of the British Westinghouse Electric Co., Manchester, and signed by foremen of various departments, recommending their workmen to organise a branch of an approved society, and advising them not to promise to join any other society; whether such action by large firms was contemplated under the National Insurance Bill; and whether, as such action is prejudicial to the interests of workmen, friendly societies and trade unions, he proposes to take any steps in the matter. Mr. Lloyd George replied that the interests of workmen who wish to belong to friendly societies and trade unions are sufficiently protected by Clause 24 of the Bill.

ELECTRIC LIGHTING COMPANIES (AUDIT OF ACCOUNTS).—Mr. Grant asked the President of the Board of Trade whether the Board of Trade insisted upon the appointment of separate auditors to audit the accounts of Electric Light Companies (pursuant to the Electric Light Act), and refused to appoint as their auditors under the Act, the auditors appointed by the companies; and whether he was aware that such double audits entailed double expense upon the companies concerned, who, in many cases, would be prepared to appoint the auditors selected by the Board of Trade.—Mr. Buxton said the answer to the first part of the Hon. Member's question was in the affirmative. He was aware that the double audits entailed some extra, though not necessarily double, expense on the companies concerned, but in view of the special objects of the Government audit, he considered that it should be conducted by an auditor who was quite independent of the shareholders.

ROYAL ASSENT.—The following Acts received the Royal Assent last week:—

Telegraph (Construction) Act, 1911.
Pacific Cable Act, 1911.
Coal Mines Act, 1911.
Telephone Transfer Amendment Act, 1911.
L.G.B.'s Provisional Orders Confirmation (No. 7), and No. 10 Acts, 1911.

BIRMINGHAM CORPORATION TRAMWAYS.—By the Bill which the Birmingham Corporation have deposited in Parliament for next session very considerable extensions of the existing tramway system are foreshadowed, as well as the running of trolley vehicles within and without the City. The estimates which have been prepared, include the following:—Tramways, £218,900; purchase of land and erection of electrical generating station, £132,500; equipment of generating station, £156,000; for the extension and development of the existing and providing new transforming substations, and laying down of electrical mains, &c., £211,500.

Institution and Lecture Notes.—INSTITUTION OF ELECTRICAL ENGINEERS (MANCHESTER LOCAL SECTION).—In connection with the above Section a conversazione arranged jointly with the Manchester Association of Engineers was held in the Whitworth Institute, Manchester, on Friday, 15th inst. At the outset, the Chairman of the Local Section, Mr. W. Cramp, and Mrs Cramp, together with the President of the Manchester Association of Engineers, Mr. Michael Longridge, and Mrs. and Miss Longridge, held a reception. The company present numbered about 260, including Messrs. S. L. Pearce, Miles-Walker, M. B. Field, J. S. Peck and S. J. Watson, past Chairmen of the Manchester Section Electrical Engineers, and Messrs. W. Fox, J. H. Stubbs, and A. Saxon, past Presidents of the Manchester Association of Engineers. An excellent programme of vocal and instrumental music was afterwards well rendered. The singing of Miss Florence Webster and Mr. Fowler Burton was especially good and was greatly enjoyed. The gathering was an even greater social success than that held last year, and judging from the many personal expressions of appreciation made, it is hoped it may become one of the items on the annual programmes of the two societies.

THE SOCIETY OF ENGINEERS (INC.).—At the second annual general meeting of the Society on December 11th, the report of the scrutineers of the postal ballot for the election of Council and officers for 1912 showed that Mr. John Kennedy had been elected president. The Bessemer Premium was awarded to Mr. R. W. A. Brewer, for his paper on "Two-stroke Cycle Engines"; the Clarke Premium to Mr. T. J. Gueritte, for his paper on "The Mechanical Installation and Upkeep of Permanent Way on Railways"; and a Society's Premium to Mr. E. Kilburn Scott, for his paper on "Nitrogen Products made with the Aid of Electric Power."

ROYAL INSTITUTION.—The following are included in the arrangements for the Friday evening meetings, before Easter, 1912:—

January 19th.—Prof. Sir James Dewar, F.R.S., "Heat Problems."
January 26th.—Prof. Bertram Hopkinson, F.R.S., "The Pressure of a Blow."
February 2nd.—James Mackenzie Davidson, M.B., "Vital Effects of Radium and other Rays."
February 9th.—John Allen Harker, D.Sc., F.R.S., "Very High Temperatures" (with electric furnace experiments).
February 16th.—The Rt. Hon. Sir John H. A. MacDonald, K.C.B., F.R.S., M.Inst.E.E., "The Road: Past, Present and Future."
February 23rd.—George K. B. Elphinstone, M.Inst.E.E., "The Gyrostatic Compass and Practical Applications of Gyrostats."
March 15th.—Frederick Soddy, M.A., F.R.S., "The Origin of Radium."
March 29th.—Prof. Sir J. J. Thomson, F.R.S., "Results of the Application of Positive Rays to the Study of Chemical Problems."

Other arrangements for lectures include the following:—
Two lectures (Tuesdays, February 27th, and March 5th, at 3 o'clock) by Prof. E. G. Coker, on "Optical Determination of Stress and Some Applications to Engineering Problems."
Six lectures, on Saturdays, February 24th, March 2nd, 9th, 16th, 23rd, 30th, at 3 o'clock, by Prof. Sir J. J. Thomson, F.R.S., on "Molecular Physics."

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (NEWCASTLE SECTION).—The following is the programme for the Session:—

January 15th.—Lecture by Mr. W. C. Mountain at 7.30 p.m. Subject, "Haulage in Mines."
January 20th.—Lecture by Dr. Thornton at the Mining Institute, Bishop Auckland, at 7.30 p.m. Subject, "Use of Electricity in Coal Mines."
January 27th.—Smoking Concert.
February 3rd.—Discussion on Mr. Beadsmoore's (Notts. and Derby Branch) paper, "Pit-shaft Signalling"; and Mr. Chris. Jones's (South Wales Branch) paper, "Earthing, Earth Plates, and Leakage Detectors."
February 21st.—Notes on "Electric Mining Signalling," by Mr. T. A. W. Smith (Newcastle Branch).
March 16th.—"Fault Location on Mining Cables," by Mr. G. Burrows (Newcastle Branch).
April 3rd.—"Underground Lighting with Low-Voltage Metallic-Filament Lamps," by Mr. F. Milburn (Newcastle Branch).
April 27th.—Visit to Steelworks at Middlesbro'.

SCOTTISH LOCAL SECTION.—The tenth annual dinner of the Scottish Local Section was held in the Grosvenor Restaurant, Glasgow, on December 12th. Mr. James Lowson, vice-chairman, presiding in the absence of Mr. Frank A. Newington, chairman of the Section. The company numbered over 240. The Very Rev. Ll. Deane, Provost of St. Mary's Cathedral, Glasgow, proposed "The Imperial Forces," Sir George Thomas Beatson, M.D., responding. Sir John H. A. Macdonald, the Lord Justice Clerk for Scotland, submitted "The Corporation of the City of Glasgow," and in a reference to the many activities of the Council, spoke particularly of the successful operations for the deepening and purification of the River Clyde. He did not know whether they had succeeded with their telephones or not, but it was at least to their credit that they had tried. Lord Provost D. M. Stevenson, in replying, said that with regard to the question of the Corporation's telephone venture, he had to pick a quarrel with Sir John. The Corporation had on their telephone service 12,000 subscribers, each of whom saved £5 on his subscription during the five years the Corporation owned the service; that meant a total saving of £300,000 to these subscribers. The Postmaster-General had assured him that he would not raise the rates to any of their subscribers for 18 months to come, and as compared with what new subscribers were paying, that added another £90,000 to the figure he had given. Prof. Barr submitted the toast of the I.E.E., remarking that the Institution had taken its rise in the days when electricity was mainly used for the communication of information from place to place. They could hardly think nowadays what the world would be like without the telegraph. Electricity was now in everything, however, and he only hoped that the older branch of mechanical engineering would still be left with something to do. In coupling with the toast the name of Mr. S. Z. de Ferranti, the Professor said they had seen Mr Ferranti rise to the top of his profession, and were glad to have him there in the capacity of President of the Institution. In his reply, Mr. Ferranti said they had heard a great deal from him recently with regard to the Institution. There had been a great discussion and a great conflict of opinion as to how they should frame their new rules, and what effect these would have on the future. He had come to the members of the Scottish Local

Section a fortnight ago with fear and trembling, but he left with the highest possible opinion of their views and the sound business-like way in which they looked upon the whole matter. The reason for his gratitude was that their views were exactly his own. In the new rules he was sure that voting by proxy would be carried through. At present it was illegal to do this, with the result that members at a considerable distance from London had practically no voice in the management of the Institution. That, he hoped, would be altered. The result of all this difference of opinion and discussion was going to be a great revival of interest in the I.E.E. on the part of the whole membership, and he had no doubt their Institution would develop into a far more useful instrument for the benefit of the profession than it had been hitherto. There were, however, differences of opinion which had still to be reconciled, and he hoped that what would happen in the long run would be for the greatest good of the majority. The Scottish Local Section had expressed itself in favour of a uniform increased subscription, and in favour of the broadening of the basis of membership as suggested in the new articles. Their largest Local Section—Manchester—held different views on those two points, but he hoped that with the interests of the whole Institution kept in view, these differences would be reconciled. To-day they were entering upon the age of domestic electricity which was going to do more for the people than all that electricity had done up till now. In connection with the smoke problem, the greatest sinner was the domestic chimney, but he was perfectly satisfied they were entering upon a period when no household would be able to afford to do its cooking, heating and other services with other means than by electricity. Mr. W. A. Chamen, in giving the "Scottish Local Section," suggested that some of the meetings of the Council might be held away from London. In reply, Mr. Lowson said they were looking forward to the summer meeting of the Institution in Glasgow, when they expected some 200 guests from the south. The proceedings were varied with vocal and instrumental music.

Continuous Service Passenger Transportation.—On Wednesday last week Mr. W. Y. Lewis read a paper before the Royal Society of Arts on the Adkins-Lewis system of passenger transportation, which he described at the last meeting of the British Association. As our readers may remember, in this system a stream of small cars weighing 2 tons each (loaded) is propelled by a screw along a shallow subway beneath the foot pavement; the stations are situated ¼ mile apart, and the pitch of the screw is shortened in the stations, so that the cars pass through (without stopping) at the rate of 3 miles per hour, while by varying the pitch the speed between stations is raised to 24 miles per hour. The screw is interrupted at stations to allow of the driving gear, thrust bearings, &c., being inserted, and the cars push one another across the gap in a continuous line; between the stations they are widely separated. Each car carries eight seats, giving a total seating capacity of 12,680 seats per hour, and the schedule speed is 16 miles per hour. The screw-shaft is of hollow section 24 in. in diameter, running at 264 R.P.M., and carrying a spiral rail forming the thread. The cars have flangeless wheels running on light flat rails, on which they are retained by guide rollers working in a slot. The stations need be only 50 to 75 ft. in length: a car would take 17 seconds to pass through the latter, giving passengers 8 seconds to get out and 9 seconds to get in, the two streams of passengers being divided. Curves are negotiated in the same way as stations, the pitch of the screw being closed so that the cars come together and push one another round the curve; the author suggests that wherever a curve is necessary, it would not be inconvenient to locate a station. A trial line, 40 yd. in length, has been constructed by Messrs. Ransomes & Rapier, at Ipswich, on which 2,000 to 3,000 passengers can be carried at speeds up to 10 miles per hour.

Mr. H. M. Hobart has reported in favour of the system as compared with existing systems of transportation, and in the discussion which followed the paper, Capt. Sankey, Mr. H. Stokes and Mr. Ll. B. Atkinson supported the author's proposals; Mr. R. P. Brousson, manager of the G.N. & City Railway, criticised it adversely, pointing out that the passenger traffic in London was not continuous, but came in rushes; that such a subway could not be constructed in London except at a deep level like the other tube railways, and that the system was not flexible, as the whole of the seating capacity must be kept in motion all day. In his reply, Mr. Lewis disputed the correctness of the objections raised.

While the system advocated by Mr. Lewis may prove very useful for short distances, for escalators, &c., we can hardly imagine that it will ever be adopted for the purpose which he outlines. It may be taken as axiomatic that it is impossible to construct shallow subways in London; as Mr. Lewis points out, the use of lifts to the deep-level tubes causes great loss of time, and the use of escalators is to be preferred—but he must accept one or other of these. Again, his system demands a perfectly straight line between stations, or curves which necessitate slowing down to 3 miles an hour, and London streets and roads are rarely straight for any great distance. The thought of a screw ¼ mile long is startling. No drivers or conductors are on the cars; various sources of mishap are inevitable, and the consequences of the derailment of a car in the middle of a ¼-mile stretch are unspeakable—car after car would crash into the obstruction at 24 miles an hour, until the screw was stopped. Mr. Lewis speaks vaguely of automatic electric devices to obviate such horrors, but we cannot attach much value to the suggestion. Many other objections occur to the mind, but it is hardly worth while to elaborate them. The idea is exceedingly ingenious, but we shall look forward to the time when aeroplanes come into fashion

Horse-Power of Motor-Cars.—A Committee has been appointed by the Treasury to consider the regulations under which the horse-power of motor-cars is assessed, and to report on the question whether amendments are desirable in connection with the assessment of steam and electric cars.

Machine Tool and Engineering Association, Ltd.—The annual meeting will be held at the Midland Hotel, Manchester, on the afternoon of Thursday, January 11th.

Physical Society Exhibition.—The annual exhibition of electrical and other apparatus took place at the Imperial College of Science on Tuesday last. There were not so many exhibits as usual, but many interesting items were shown, of which we shall publish particulars in later issues.

Inquiries.—A correspondent wishes to meet with some manufacturer who will undertake to supply him with electric boilers capable of evaporating 20 to 40 gallons of water per hour at 5 to 10 lb. steam pressure.

Makers of switches for automatically short-circuiting series boosters, when the supply fails to the motor driving them, are asked for.

Names of present agents for Acheson's Aquadag and Oildag are wanted.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—As a result of the inquiry by the Hampstead Borough Council into the exceeding of the estimates for converting the public street lamps for electric lighting, by over £10,000, the Council decided that MR. G. H. COTTAM, chief electrical engineer, should be asked to resign, and that the services of MR. E. SAYER, chief assistant engineer, should be dispensed with forthwith. Mr. Cottam has since placed his resignation in the hands of the Council. The Lighting Committee recommended that Mr. Cottam and Mr. Sayer should be severely reprimanded, and that the latter should have his salary reduced by £50, but the Council decided on more drastic measures.

The King's Lynn T.C. has appointed MR. CHAS. WM. JACKSON, chief assistant engineer, as borough electrical engineer, at a salary of £150 per annum, rising by £10 a year to £200, with house, coal, rates and lighting, and with permission to take two pupils.

The Weymouth T.C. on December 14th decided to increase the salary of the borough electrical engineer by annual instalments of £50 as from March 30th, 1912, to a maximum of £400 per annum, in recognition of his withdrawal from selection for an appointment elsewhere.

At a meeting of the South Shields T.C. on 13th inst., MR. HARRY S. ELLIS, deputy city electrical engineer and manager for Bradford Corporation, was appointed borough electrical engineer in succession to MR. J. H. CAWTHRA, who has recently received an appointment in South Africa. The salary is £400 per annum. Mr. Ellis is a younger son of Ald. Sir Joseph Baxter Ellis, of Newcastle.

MR. WM. COLLIER BEXON has been appointed electrical engineer and tramway manager at Kilmarnock, in succession to MR. A. BURBIDGE, who has received a similar appointment in Mandalay, Burmah. Mr. Bexon has been assistant to Mr. Burbidge since May last, when he went to Kilmarnock from Croydon.

Tramway Officials.—MR. W. H. MUNTON has been appointed electrical and works engineer to the Bristol Tramways and Carriage Co., Ltd., and MR. SYDNEY SMITH, who has returned from Australia, has taken up his former position as assistant manager.

General.—An Australian exchange states that MR. A. G. H. MAY has commenced practice as a consulting electrical engineer at 157, Collins Street, Melbourne. He has had experience with electrical undertakings in many parts of the world, principally with the General Electric Co., of United States, and has recently supervised the erection of the electric power plant at the State coal mine, Wonthaggi, Victoria.

MR. FRANK W. SKINNER has been appointed teacher of the Electrical Engineering classes at the Barrow Technical Schools in succession to Mr. G. Mallinson, who has tendered his resignation.

At the Mersey Railway power station, on 15th inst., MR. A. H. ELY (shift engineer) was presented with a 400-day clock on the occasion of his marriage. The presentation on behalf of the staff was made by Mr. R. Somerville Bayntun. Mr. Ely leaves shortly for Melbourne, Australia.

The employés of Messrs. Siemens Bros., Ltd., Stafford, on Friday presented a piano to MR. E. O. KIEFFER, works manager, on his marriage.

Obituary.—MR. WILLIAM TRASK.—We regret to learn of the death which occurred on December 6th, at the age of 57 years, of Mr. William Trask, who was formerly in business as an electrical engineer in Upper Marylebone Street, London, for very many years

NEW COMPANIES REGISTERED.

Mexican Fuel and Power Co., Ltd. (118,962).—Registered December 6th, by Deacon & Co., 9, Great St. Helens, E.C. Capital £100,000 in £1 shares (50,000 pref.). Objects: To carry on business as manufacturers of, and dealers in, peat, peat briquettes and other patent or prepared fuel, ironmasters, steel makers and converters, manufacturers of chemicals and manures; to acquire lands and interest therein, water privileges or concessions and water and other powers, to utilise and develop the same for the generation or production of electric, steam, pneumatic, hydraulic or other power in Mexico, and to adopt an agreement with the Peat Industry Co. The signatories (with one pref. share each) are:—W. J. Park, 7, Tabley Road, Holloway, N., gentleman; R. C. Allen, 208, Dunstan's Road, East Dulwich, gentleman; W. Eacott, 118, Addison Gardens, W., gentleman; H. C. Blackborow, 34, Elsham Road, Leytonstone, gentleman; H. J. Fisher, 9, Great St. Helens, E.C., solicitor; E. W. Bell, 9, Great St. Helens, E.C., solicitor; E. F. Medcalf, 9, Great St. Helens, E.C., solicitor. Minimum cash subscription, 40 per cent. of the share capital offered to the public. The first directors (to number not less than three or more than nine) are:—H. J. Chinnery, J.P., Fringford Manor, Bicester (director of Mexican Central Railway Securities Co., Ltd.), H. L. Stokes, 2, London Wall Buildings, E.C. (director of Wankie Colliery Co., Ltd.), F. Hurdle, Pinner's Hall, Austin Friars, E.C. (chairman of Marston, Thompson & Evershed, Com. Hon. C. A. Donison, R.N., 114, Belgrave Road, S.W.; A. L. Mills, M.A.S.C.E., Appartado 123 Bis, Mexico City; F. W. Johnstone, Mexico City (vice-president of National Iron and Steel Works) and S. W. Rider, Mexico City (vice-president of United States and Mexican Trust Co.) The three last-named are directors of the Peat Industry Co., and will join the board after allotment. The holders of pref. shares have the right to appoint a majority of directors, including the chairman; qualification (except first directors and directors appointed within the first six months of incorporation), £250; remuneration, £200 each per annum (chairman £250). Registered offices, Pinner's Hall, Austin Friars, E.C.

Holmquist Electric Co., 1910, Ltd. (118,875).—This company was registered on December 1st, with a capital of £200 in £1 shares, to carry on the business of manufacturers and hirers of and dealers in the "Holmquist" and other replacement electric heaters, electric light baths and their appliances, &c. The subscribers (with one share each) are:—C. M. Holmquist, 69, Leighton Road, West Ealing, W., electrical engineer; V. K. Gastafsson, 49, Cardington Street, Euston, N.W., electrical engineer. Private company. Table "A" mainly applies. Registered by J. McEvory, 93, Roseman Street, E.C.

Carrara-Versilia Electric Railway and Power Co., Ltd. (119,077).—Registered December 13th, by Slaughter & May, 18, Austin Friars, E.C. Capital £250,000 in £1 shares. Objects: To acquire a concession from the Italian Government, to construct, equip, work and maintain an electric railway in the district of Carrara-Versilia, Province of Lucia, to carry on the business of railway, tramway, omnibus and van proprietors, manufacturers, and dealers, carriers of passengers and goods, manufacturers of and dealers in trucks, locomotives, accumulators and dynamos, suppliers of electricity for light, heat, motive power or otherwise, &c., and to adopt an agreement with Rhys-Jones, McTaggart & Burch, Ltd. The signatories (with one share each) are:—J. M. Jolliffe, 20, Abington Villas, Kensington, W., secretary; A. G. Brown, 56, Hopedale Road, Charlton, accountant; Z. Costanz, 47, Gower Street, W.C., gentleman; D. Avory, 92, Ashworth Mansions, N.W., gentleman; A. G. Dobrantz, 54, Mazenod Avenue, West Hampstead, clerk; A Corbett, 18, Austin Friars, E.C., solicitor; W. A. Pittman, 10, Springfield Avenue, Harlesden, N.W., gentleman. Minimum cash subscription seven shares. The first directors (to number not less than three or more than seven) are Lord Vaux, Harrowden Hall, Wellingborough; W. J. Smith, J.P., Lands House, Rastrick, Brighouse, Yorks.; D. R. Davies, 5r, Montague Mansions, Portman Square, W.; M. Rhys-Jones, 87, Belsize Park Gardens, Hampstead, N.W.; and J. F. D. Bowden, 19, Rue Lafayette, Paris. Remuneration of chairman, £400 per annum; of ordinary directors, £250. Registered office, 1, Broad Street Place, E.C.

Ceara Tramway, Light and Power Co., Ltd. (119,030).—Registered December 11th, by Roney & Co., 42, New Broad Street, E.C.; capital £400,000 in £1 shares (200,000 7 per cent. preference). Objects: To construct, project, hire, lease, or acquire tramways and light railways in any part of the world; to equip, maintain, and work by electricity, steam or other power, all tramways and railways belonging to the company; to carry on the business of tramway, railway, omnibus and van proprietors, carriers of passengers and goods, manufacturers of and dealers in carriages, trucks, locomotives and rolling stock of all kinds, suppliers of electricity for light, heat, motive power, telephonic, telegraphic, industrial or other purposes, &c., and to adopt an agreement with the City Improvements Co., Ltd. The signatories (with one share each) are:—J. H. Hyland, 99, Eton Road, Ilford, cashier; H. L. Bankes, 152, Newport Road, Leytonshire, clerk; H. R. Borrowdale, 17, Quebec Avenue, Southend-on-Sea, clerk; A. G. Hulton, 17, West Square, Southwark, S.E., clerk; J. Brown, 42, New Broad Street, E.C., secretary; J. W. Ryder, 64, Windsor Road. Leyton, clerk; J. A. Roney, 42, New Broad Street, E.C., secretary. Minimum cash subscription, seven shares. The directors are to number not less than two or more than nine; J. H. Hyland and H. L. Bankes are provisional directors, pending appointment of board by the signatories; qualification (except provisional directors), £250; remuneration, £200 each per annum (chairman £250). Registered office, 42, New Broad Street, E.C.

Indicating Fuse and General Manufacturing Co., Ltd. (119,088).—This company was registered on December 13th, with a capital of £2,000 in £1 shares, to take over the business of an electrical and general engineer carried on by F. Kershaw, at 50 and 51, High Holborn, W.C., as the Indicating Fuse and General Manufacturing Co. The subscribers (with 100 shares each) are:—F. Kershaw, 77, Chandos Avenue, South Ealing, W., engineer; W. J. Seton, Bramshot Golf Club, Fleet, Hants., resident proprietor and secretary. Private company. The number of directors is not to be less than two or more than four; the first are F. Kershaw and W. J. Seton; qualification, £50; remuneration, £25 each per annum. Registered office, 50 and 51, High Holborn, W.C.

Ballinamallard Electric Light and Power Supply, Ltd. (3,761).—This company was registered in Dublin on December 14th, with a capital of £500 in 5s. shares, to carry on the business of providers of electric current for lighting, motive power, or any other uses, and especially to provide light for the village of Ballinamallard, Co. Fermanagh. The subscribers (with one share each) are:—T. Craig, Ballinamallard, mill owner; W. Campbell, Ballinamallard, grocer; T. J. Crozar, Ballinamallard, general merchant. Private company. The number of directors is not to be more than seven; the first are T. Craig, W. Campbell and T. J. Crozar; qualification, £2 10s. Registered office, Ballinamallard, Co. Fermanagh.

Worsley & Page, Ltd. (119,164).—This company was registered on December 15th, with a capital of £2,000 in £1 shares, to adopt an agreement with E. Worsley for the acquisition of the business of an electrical engineer carried on by him at Harris Street Works, Millfield, Peterborough, as E. Worsley & Co. The subscribers (with 250 shares each) are:—E. Worsley, 12, Glebe Road, Peterborough, electrical engineer; E. W. Page, 14, St. Ann's Square, Manchester, electrical engineer. Private company. The number of directors is not to be less than two or more than three; the first are E. W. Page and E. Worsley (managing director). Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Oswald Carr, Ltd.—Particulars of £150 debentures, created November 30th, 1911, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future. No trustees.

Thomassin & Co., Ltd.—Particulars of £200 debentures, created November 23rd, 1911, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £100. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

"Z" Electric Lamp Manufacturing Co., Ltd.—Issue on December 1st, 1911, of £1,000 debentures, part of a series of which particulars have already been filed.

Bauxite Refining Co., Ltd. (98,531).—Issue on October 30th, 1911, of £4,000 debentures, part of a series of which particulars have already been filed.

Jackson, McConnan & Temple, Ltd. (67,699).—A memorandum of satisfaction the extent of £17,000 on November 14th, 1911, of debentures dated March 14th, 1901, securing £22,000, has been filed.

Corona Lampworks, Ltd. (116,527).—Issue on November 21st, 1911, of £400 debentures, part of a series of which particulars have already been filed.

Switchgear Co., Ltd. (85,405).—A memorandum of satisfaction in full on October 27th, 1911, of debenture dated August 2nd, 1905, securing £3,000, has been filed.

J. B. Saunders & Co., Ltd. (112,037).—Return dated December 6th, filed December 12th, 1911. Capital £20,000 in £1 shares (6,000 "A" and 14,000 "B"). 6,000 "A" and 12,000 "B" shares taken up. £18,000 considered as paid. Mortgages and charges: Nil.

Frederick Braby & Co., Ltd. (2,537c).—Return dated August 31st, filed November 1st, 1911. Capital £250,000 in £10 shares (2,500 preference). 20,000 ordinary and 2,500 preference shares taken up. £9 per share called up on 16,750 ordinary, £5 per share on 3,250 ordinary, and £10 per share on 2,500 preference. £192,020 paid (including £20 on five shares forfeited). £13,000 considered as paid on 3,250 ordinary shares (being £4 per share). Mortgages and charges: £55,000.

Ernest Scott & Mountain, Ltd. (32,760).—Return dated November 8th, filed November 16th, 1911. Capital, £150,000 in £1 shares (50,000 preferred ordinary). 97,790 ordinary and 29,800 preferred ordinary shares taken up. £1 per share called up on 75,790 ordinary and 29,800 preferred ordinary. £105,590 paid. £22,000 considered as paid on 22,000 ordinary shares. Mortgages and charges: £50,000 first debenture stock and £35,000 second debentures.

Electromobile Co., Ltd. (75,139).—Issue on November 18th of £165 5 per cent. debentures, part of a series created August 3rd, 1911, of which particulars have already been filed.

Bombay Electric Supply and Tramways Co., Ltd. (85,055).—Return dated August 2nd, filed October 19th, 1911. Capital £1,200,000 in £10 shares (60,000 preference). All shares taken up. £10 per share called up on 60,000 preference and 29,992 ordinary (excluding eight ordinary shares forfeited). £929,956 paid, including £36 on the said forfeited shares. £270,000 considered as paid on 27,000 ordinary shares. Mortgages and charges: £788,328.

Feld Bros. & Co., Ltd. (105,577).—Return dated September 29th, 1911. Capital £5,000 in £1 shares. 1,202 shares taken up. £202 paid. £1,000 considered as paid. Mortgages and charges: Nil.

Ferranti, Ltd. (83,718).—Return dated November 3rd, 1911. Capital, £130,000 in 60,000 preference, 60,000 ordinary and 10,000 deferred shares, all of £1 each. 53,374 preference, 60,000 ordinary and 10,000 deferred shares taken up. £123,574 paid. Mortgages and charges: £135,732.

Electric Reduction Co., Ltd. (54,724).—Return dated October 30th, 1911. Capital, £40,000 in £1 shares (16,200 preference and 23,800 ordinary). All shares taken up. £13,000 paid on 13,000 preference. £27,000 considered as paid on 3,200 preference and 23,800 ordinary. Mortgages and charges: £7,500.

Seale, Austen & Barnes, Ltd.—Mortgage on freehold land and outbuildings at Tonbridge, Kent, dated November 24th, 1911, to secure all moneys due or to become due from the company to Union of London and Smiths' Bank, Ltd.

Keighley Electrical Engineering Co., Ltd. (44,893).—Return dated September 22nd, filed October 16th, 1911. Capital, £10,000 in £1 shares (3,000 preference). 4,200 ordinary and 1,800 preference shares taken up. £1 per share called up on 2,580 ordinary and 1,400 preference. £3,988 paid. £2,012 considered as paid on the remainder. Mortgages and charges; £5,000.

CITY NOTES.

Nairobi Electric Power and Lighting Co., Ltd.

THE fifth ordinary general meeting of this company was held on December 12th at the offices, 8 and 9, Martin's Lane, Cannon Street, E.C., Sir Stanley Edwards, K.C.B., in the chair.

The CHAIRMAN, in moving the adoption of the report (see ELEC. REV., page 914), said that the company's progress during the year 1910 had been quite satisfactory, and the directors were further pleased to report that this progress was well maintained up to date. A comparison of the accounts with those of the previous year showed that the revenue derived from the sale of current had increased from £1,612 to £2,718, while the working expenses showed only a very slight increase, and the adverse balance in the revenue account had now been converted into a net profit of £403, after payment of debenture interest. On the credit side of the balance-sheet would be seen the item of reserve account dealt with by resolution of the board, and requiring confirmation at that meeting of members. The explanation was that in the early stages of the company's undertaking it was impossible to estimate fairly the annual allowance to be made for depreciation of machinery and plant, and a generous

reserve account was created, chiefly to provide for this. Since then they had the experience of three years' working, and knew better the conditions prevailing and to be expected in this new country, and it was considered that the allowance made in the accounts of previous years had been too great. The machinery and plant had been efficiently maintained, and the cost of repairs and renewals charged against revenue in each year, and this would be continued. The managing director had gone very fully into this matter, and the directors were advised by those best qualified to judge, that if thus efficiently maintained, the machinery and plant should outlast the life of the company's concession, which was for about 20 years yet to come. In view also of the increasing prosperity of the company, the board had decided to adopt a new policy of setting aside out of profits a yearly sum for the redemption of capital, to commence with the next year's accounts, and in these circumstances to write back the amount of £3,364 standing to the credit of reserve account at the end of 1909, which had been done in the balance-sheet now under consideration, and was submitted for confirmation by the present meeting. It would be seen by the report that the managing director had recently returned to Nairobi, and his first reports were expected here in about 10 days. Recent advices from Nairobi showed a continued improvement, and the increasing demand for current had necessitated the installation of an auxiliary power house on the Ruera River, to enable the company to satisfy the local requirements, and this should be completed in the course of the next three or four months, and so add to their revenue-earning capacity. The cost of this new power station would be largely met out of revenue. The directors anticipated that the accounts for 1911 would show as great an advance over those of 1910, as those of 1910 did over those of the previous year.

MR. A. W. MAYO-ROBSON, C.V.O., in seconding the motion, said he was out in Africa last winter, and in February he visited the company's works at Ruera, and he was pleased to say that everything was in perfect order. He saw the dam, the water-ways, and the machinery in full work. He also saw, and fully approved of, the proposed arrangement for the installation of an auxiliary power house on the Ruera River. About a quarter of a mile above the present dam and power house there was a remarkable fall, and by raising the dam it would be possible to obtain a great additional volume of water which would give them a large amount of extra power. Seeing that at the time he saw the water coming over a three years' drought had just ended, he thought they might feel quite sure that the river would give them a permanent supply of power.

The Secretary, MR. G. A. HIGLETT, mentioned that that morning he had received a letter from the company's resident engineer, stating that an expenditure of £90,000 had just been sanctioned at Nairobi for new railway offices, bungalows, &c., from which the company should benefit in the future.

The report was adopted.

Melbourne Electric Supply Co., Ltd.

THE annual meeting was held on Monday, at the offices, Finsbury Pavement House, E.C., Mr. J. B. Braithwaite presiding.

The CHAIRMAN, in moving the adoption of the report (see ELEC. REV. last week), congratulated the shareholders upon the progress which it indicated in the prosperity of the company. He said that the profit and loss account showed a very remarkable expansion in the profit at Melbourne and also a fair expansion in the profit at Geelong. The profit at Melbourne had increased from £19,279 to £33,226, whilst the profit at Geelong had risen from £2,022 to £3,206. The profits at Adelaide had also grown, with the result that they had received in dividends from that city £9,715, as against £6,981 last year; the total result being that they had £46,433 of revenue as against £28,428. The directors recommended them to dispose of that revenue in what he hoped they would consider a somewhat conservative manner. The effect of their recommendations would be to give the company a very clean balance-sheet, with the suspense account entirely wiped out, and with a carry forward sufficient to ensure the maintenance of the dividend paid this year. When they came to look into the details of the account, it would be seen that the position, as far as revenue was concerned, was extremely satisfactory. In Melbourne their revenue from private supply had risen from £26,271 to £34,903, whilst the revenue from power supply had increased from £12,232 to £17,119, and there had also been some increase in the receipts from public lighting. Their supply to the municipal tramways had risen from £935 to £3,859, and meter rents had gone up proportionate to the increase in the number of consumers, with the result that the total revenue had been £61,719, as against £44,396, and after adding the expenses of generation, and spending £4,770 on repairs and renewals, they had a balance of £33,226 to carry to the balance-sheet, as compared with £19,379 last year. That was very satisfactory, and had been brought about by the continuous increase in the number of their consumers, which was going on year after year. They had laid on mains in no less than 75 miles of new streets last year, making the total streets in which their supply was available in Melbourne and suburbs 206 miles. They had taken on during the year 2,071 fresh consumers, and they had sold over 5 million units of electricity in Melbourne alone, as against 3,400,000 last year. At Geelong, although they regarded that as rather a sleepy little place, the total number of consumers had increased by 22 per cent., and, altogether, Geelong had earned 50 per cent. more than the previous year. The return was still not at all adequate for the capital which had been expended, but it showed a decided improvement. The tramways they were putting down there were now approaching completion, and they anticipated they would be open for traffic about the middle of next January. Since the accounts were made up they had placed the remaining 10,000 £5 7 per cent. first preference shares at par, and that had enabled them to reduce their loans considerably. As to the prospects for the future, there was no doubt that Australia had had two or three very prosperous seasons, and at the present time the company's rate of progress was going on very rapidly indeed. At the end of August, which was the end of their financial year, there were then 6,728 applications for 30-watt lamps waiting to be connected, and applications for 342 H.P. That was at Melbourne. At Geelong there were 978 lamps and 78 H.P. waiting. At the end of September those numbers had increased, and at the moment they were unable to keep pace with the demand for fresh supply. That was very gratifying, and if it continued they might see a very large increase in their revenue from Melbourne again. In conclusion, the chairman paid a tribute to the technical and commercial staff which the company possessed in Australia.

MR. D. FINLAYSON seconded the motion.

DR. MOODEY said he was sure he was voicing the opinions of all the shareholders when he expressed his great satisfaction at the report. He was pleased that the board had adopted a conservative policy in dealing with the profits, for, as the chairman had pointed out, Australia had had some very good seasons recently, and a setback might come at any moment.

MR. BROOKMAN also congratulated the directors upon the report, and asked whether it would not be possible for them to pay an interim dividend next year.

The CHAIRMAN, in reply to these and other observations, said it was quite impossible to say at what rate their capital expenditure would proceed this year. He should say that at Geelong, the expenditure would continue at about the same rate as last year, less, of course, the expenditure on the tramways. They expected that their generating costs would be relatively more favourable during the coming year. With regard to an interim dividend, he would not like to commit himself in any way at the present time. That must entirely depend upon the progress of the company, but if their net earnings should expand in a manner that warranted them paying an interim dividend, the matter would be considered by the board. They had received a cable that morning from Mr. Clements, their general manager in Melbourne, informing them that the supply had just been commenced in two important suburbs, Camberwell and Hawthorn, and that the order for another suburb, Moorabbin, had been granted, and that application had been made for an order for the suburb of Oakley, which was likely to be granted.

Following the re-election of the directors and auditors,

MR. BROOKER moved a vote of thanks to the chairman and directors, together with a proposal that £500 be granted them as special remuneration.

DR. MOODEY seconded the resolution.

The CHAIRMAN said that while thanking the proposer and seconder for their kindness, personally he thought it would be best for the shareholders to wait until they had received 5 per cent. before anything was done in the way of increasing the directors' fees.

MR. BROOKER said that in view of the chairman's remarks he would withdraw that part of the resolution relating to the special remuneration, but he would hope to bring it up again at a future meeting if the prosperity of the company continued.

The vote of thanks was then passed and the proceedings terminated.

Helsby Wireless Telegraph Co., Ltd.—According to the newspapers, Major B. Baden-Powell presided on Wednesday at the meeting of this company, and read the speech which Col. J. Bernard would have delivered if he could have been present. He was detained, giving evidence at the arbitration proceedings regarding the company's application for a licence to work under Sir Oliver Lodge's extended patent. A reduction of the capital from £20,498 to £10,000 was now recommended, such reduction to be effected by cancelling 10,498 shares intended to be surrendered by the company. The business had been hampered by the undecided position as regarded wireless patents in this country during the year. It is proposed to enter into a new working agreement with the B.I. & Helsby Cables, Ltd., and their subsidiary, the Automatic Telephone Manufacturing Co., Ltd.

Turkey.—The *Times* correspondent at Brussels says that the group formed at Constantinople, which includes the Deutsche Bank, other German banks, Belgian transport concerns, and a large Belgian bank, acquires the capital of the Metropolitan Railway Co. of Constantinople from Galata to Pera, becomes the principal shareholder in the Constantinople tramways concern, and obtains by agreement with the firm of Ganz, of Buda Pesth, a monopoly for the electric lighting of Constantinople. The group is to be formed into a company with a capital of 100,000,000 fr. (£4,000,000).

Callender's Cable and Construction Co., Ltd.—The preference and debenture registers will be closed from December 15th to 30th, inclusive.

Winnipeg Electric Railway Co.—A quarterly dividend at the rate of 12 per cent. per annum is announced, payable on January 2nd.

Anchor Cable Co., Ltd.—The debenture register is closed from December 15th to 30th inclusive.

India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.

The forty-eighth ordinary general meeting of the shareholders of the above company was held on Tuesday at the offices, 106, Cannon Street, E.C., Major Leonard Darwin, the chairman, presiding.

At the outset of the proceedings, the Secretary read two letters from absent shareholders—one from Mr. C. A. Flint and the other from Mr. J. E. Gwynn. Mr. Flint wrote that some explanation would be expected from him by the shareholders with regard to the resolutions he had proposed to submit to the meeting. Referring to the memorandum sent out by the directors in October, in which they criticised certain of the statements which he (Mr. Flint) had made in the circular he sent to the shareholders in July, he wrote, "it was not unreasonable to infer from the directors' memorandum that the current report would show more favourable results than had been anticipated, and that the market quotations, as given in my circular, overstated the estimated losses of the company. In view of the directors' memorandum, I gave notice of resolutions for equalising dividends, but within six weeks the directors issued the most disastrous report in the history of the company." Mr. Flint then criticised the action of the directors in issuing their memorandum, and said that the real loss on the year was £85,000, for although the accounts only showed a loss of £55,457, the special reserve of £30,000 set aside last year for possible depreciation of stocks, was not referred to in the report. In view, however, of the new situation created by the report, it was obviously inopportune to propose a resolution for forming a fund for the equalisation of dividends, and he therefore withdrew it. Mr. Gwynn, in his letter, gave it as his opinion that, with a capital of, roughly, 1½ millions, to have no dividend on the ordinary shares, showed a want of good management.

The Chairman then proceeded to move the adoption of the report. He said he wished to express the very great regret of the board that the year's trading should show such a very bad result. To judge by the accounts of previous years, the gross profit should have been in the neighbourhood of £175,000, whereas they could only lay before them on this occasion a gross profit of £64,178. He found that, in round figures during the previous 10 years, their gross profits were respectively: £155,000, £163,000, £196,000, £119,000, £169,000, £147,000, £169,000, £167,000, £177,000, £180,000. The year in which they showed £119,000 as gross profit was 1904, when the board felt that it would be unwise to recommend a distribution of more than 5 per cent. to the shareholders. Since that date the usual 10 per cent. had been paid; and he might mention in passing that the average dividend paid for the last 46 years, up to last year, was 10 per cent., whilst, with the exception of 1904 and the current year, the dividend paid during 34 years had never been less than 10 per cent. His duty towards them under the present circumstances was to try to explain as clearly as was possible how it came about that last year's trading was so unprofitable. There appeared to be two causes for this. The main cause was the enormous fluctuations which took place in the price of raw india-rubber during the past two years. The possible effects of the staple raw material varying in price from 3s. 10d. to 12s. 6½d. per lb. in the short period of 13 months, were alone sufficient to account for a complete dislocation of their trade. To deal with an assumed case; in a business consuming this raw material in its various grades to the amount of 1,000 tons per annum, the effect of a variation of 1d. per lb. would be £9,333 sterling a year. The figures he had given above, as representing the extreme variations in price of the highest grade rubber, viz., 3s. 10d. and 12s. 6½d., differed by over 104 pence. By multiplying £9,333 by 104 they saw, therefore, that about one million pounds sterling represented the extra cost of buying this amount of highest grade rubber at the higher price, over the cost at the lower price quoted. One should assume, however, that no manufacturer consumed only highest grade india-rubber, and if lower grades of rubber were included in the bulk, the average cost might be about half this amount, and the difference between the extremes would be also half, or, say, £500,000. Stated in another way, 1,000 tons at 12s. 6½d. per lb., amounted to £1,405,000, and at 3s. 10d. per lb., amounted to £430,000, or, if one assumed that the 1,000 tons used average one-half the price of the finest grade, the figures would be £702,500 and £215,000, a possible difference of £975,000 in the first case, and £487,500 in the second. No doubt the highest and the lowest prices did not last for long, and he only submitted the above figures with the object of emphasing the great difficulties encountered in the situation they had to face, although at the same time he might say that the amount of rubber mentioned was not an impossible quantity for fairly large consumers to use in a year. The second important point to be borne in mind was the fact that manufacturers were optimistic, as they ought to be, or they would never overcome the numerous obstacles they met in their everyday business life. But this optimism led them to sell at too low a profit on a rising market, when they should be preparing to meet the inevitable losses which must come later on if the price of raw material fell rapidly, and if stocks made at a high cost had to be realised at any price obtainable in order to avoid the even greater losses which would be experienced if they were held back. Under the ordinary conditions of the market they did not suffer much from irregularity in prices; but in the period of absolute folly which prevailed in what was known as the rubber boom, no prudence of conduct could possibly have avoided the trouble experienced. Some of those present doubtless had knowledge of the variations that had occurred at different times in the prices of copper, cotton, jute, coffee, sugar, or grain; but he doubted very much if any of them had in their memory a variation in prices of articles of large consumption which established a ratio of 3½ to 1 between the highest and lowest prices recorded in 13 months. In dealing with such a situation, the manufacturer might join the gamblers and take his chances, or he might stand aside. The first of these alternatives the directors could under no circumstances adopt, whilst as to the second alternative, this was considered in the form of closing the works for a time. In this consideration full weight was given to the disorganisation in the company's business which would ensue if the 4,500 workpeople connected with Silvertown and Persan Works had been disbanded for even three months. They decided, therefore, to battle through the difficulties as best they could, with the result that was now before them. Finally, it was true that the board now felt that it might perhaps have been better to have paid 5 per cent. dividend, instead of 10 per cent. a year ago, and 5 per cent. at the present juncture; but the difference to the shareholders, had this course been adopted, would not have been very material.

Mr. R. K. Gray seconded the motion.

Mr. Reynell remarked that, with one exception, the directors had paid a dividend of 10 per cent. for over 40 years. The past year during which the price of their raw material soared up to 12s. 6d. per lb., must have been a most difficult and anxious time for them. Therefore, if they could show that they had used proper discretion, even if the balance was against them, he thought their good record of 40 years should obtain for them the continued confidence of the shareholders, and a belief that the company would again return to its old times.

Mr. Schmitto said the chairman had said absolutely nothing as to what had happened since the end of the financial year, and as to how the company was doing at the present time. For a long period now, rubber had averaged about 5s. or 6s. per lb., and he thought the directors would have to regard that as the staple price for some time to come. What he would like to know, as a preference shareholder, was whether, assuming that to be the case, the directors considered that they would be able to make a profit. He also would like to know whether the reserve fund was a cash investment, or was it invested in the business. If it was in the business he regarded it as wholly illusory as a reserve fund.

Mr. Winkley complained of the baldness of the information given in the report, and said the directors had not expressed one word of regret for the present condition of things. He took it that, on the whole, their foreign agencies had done fairly profitable business, and it was the head department which had been an absolute failure. In the balance-sheet there was an item of £95,000 odd for shares in other companies. Had any dividend been received on those shares, and, if so, why was it not shown in the profit and loss account? It seemed to him that the whole position from beginning to end was very unsatisfactory. He saw that the Telegraph Construction and Maintenance Co. had paid a dividend of 10 per cent., and why had they not done the same?

Mr. Collis said the most material point for the shareholders to know was whether the directors had valued the stock at such a price that there would be a margin of profit for the future. If they had only half dealt with the situation they would have to write down the stocks again next year. It would be a satisfaction if the shareholders could be assured that the situation had been really grappled with, and that from now the stocks were on a safe basis. He noticed that the auditors drew attention to the fact that nothing had been written off depreciation of steamships during the year, and he would like to know whether that was anything unusual. With regard to the reserve fund being used in the business or invested separately, that was always a debateable point, but it was quite clear that in their case if the fund had not been so used the directors would have had to raise additional capital.

Mr Rathbone asked whether all the losses which had been made had been in respect of contracts entered into before the fluctuations occurred in the price of rubber.

Mr. Furse said he believed the company manufactured as good an article now as they ever did, but speaking as a commercial man dealing with the class of goods which the company sold, he had no hesitation in saying that their methods were as antiquated as the hills. During the last 25 years other huge concerns had sprung up doing the same class of business, which were making big profits, because they went the right way about it in putting their goods on the market. He (the speaker) came from Nottingham, and there they very seldom heard anything of Silvertown now. He was an electrical engineer and could remember the time when Silvertown cable was always specified for in contracts, but, to a large extent, that cable had disappeared from present-day specifications, simply because the thing was not persevered with among consulting engineers. The company still had a name to conjure with, but new ideas and new methods must be brought to bear on the commercial side, so that the business might be brought there instead of going to other firms. He questioned whether the whole of the loss was in rubber; he rather thought it was in the general turnover. He would like to know from the chairman whether the total sales were up or down.

Mr. Verey remarked that he was an original shareholder in the company, and he failed to see how the fluctuations in the price of rubber should have caused the enormous losses which they had had to face.

Mr. Atkinson asked whether it would be legal for the directors to use part of the reserve fund in payment of the dividend.

Mr. Charrington asked what rates the company was paying at Silvertown. There was, he said, a suggestion some time ago that if the rates continued to go up they should follow the example of other firms, and remove their works into the country. So far, they had spoken entirely about rubber, but he would remind them that all cables were not covered in rubber. He admitted that the cables manufactured by the company were "tip-top"—there was nothing

to touch them, but other companies adopted paper and jute insulation. If they depended entirely upon rubber they were bound to have these continual fluctuations in price of raw material, and he would suggest that the directors might consider the advisability of selling more jute and paper cable.

Mr. Foster called attention to the remark of the auditors to the effect that they were unable to certify the value of the shares which the company held in other companies, and said that surely that information must be in the possession of the directors.

Mr. Ware remarked that for years there had been a mention in the report of 150 miles of cable, laid and not paid for. There was no mention of that this time, and he would like to know whether the money had been paid.

The Chairman, in reply, said that Mr. Schmitto had asked whether there would be any difficulty in making a profit if the price of rubber remained fairly steady at from 4s. 6d. to 6s. a lb. To that he could only say that they saw no more difficulty in making a profit in the future than in the past if the price of rubber remained steady. They maintained that it was the fluctuations in the price that had caused their misfortunes, and, therefore, if the price remained steady, whether it was 4s., 5s. or 6s., it made very little difference to the profits—the point was that it should remain steady. Then he asked about the reserve fund. That was entirely in their buildings. As the company was built up, money was taken from profits and employed in buildings and machinery, and, therefore, the reserve fund was in those items and in the business generally. He maintained that it would have been absolutely impossible to have built up the company to its present state of prosperity if they had adopted any other method. If instead of taking that £450,000 from their profits they had gone to the public and asked for more capital, they would have had great difficulty in getting it, and the only possible way of building up a company of that sort was by taking money from profits and putting it into the business. It might not be a reserve fund in the way the word was sometimes used, and they would be glad, if possible, to adopt some other word for it, but it was a word adopted in the trade. Mr. Winkley inquired as to the shares in other companies. The largest other company in which they had got shares was the Palmer Tyre Co., and it was mainly a matter of book-keeping. If he remembered rightly, the company owned practically the bulk of the shares in the Palmer Tyre Co., and, therefore, the amount appearing on the balance-sheet as the Palmer Tyre Co.'s shares was almost a matter of cross entries, and the valuation would be in the same way. There was one other company in which they had got a certain share—an electric lighting company which they had established in the North of England. One way of doing business was to start a company for electrically lighting a town, and in that way get contracts for the work. In one instance they had done that, and that company was now beginning to pay, so that every one of the companies they had got shares in was paying. The Palmer Tyre Co. this year paid a dividend of 15 per cent., but as he had said that was only a nominal transaction, because it was really taking money from one pocket and putting it into another. Mr. Winkley referred to the Telegraph Maintenance and Construction Co., and compared it with their company. That confirmed the directors' opinion that the price of rubber was to a large extent the factor in their losses, because unless he was misinformed that company dealt far more in gutta-percha than in rubber. Mr. Collis asked a question as to the stocktaking. They had found that the safest method of stocktaking was to lay down definite rules as to the prices at which stocks were valued. It was very difficult to lay down a definite rule which did not work unfavourably in some respects. If the market was falling that did, no doubt to a certain extent, over-value the stock, but it was difficult to prevent that. The safe way really with a big company of that sort, and looking from one year to another, was to adopt a definite rule, and if they took their stocks over a number of years they could not go far wrong. They had adopted that definite rule, and he thought he might say that their stocks now were in a satisfactory condition. They were not excessive, and they had no reason to suppose that they were in any way overvalued. As to the ships, it was perfectly true that they had not written down their value this year, and not for many years. They were all old ships, and had been written down heavily in the past, and they believed that that writing down, and keeping them up out of revenue, had the result of ensuring that they were not overvalued in the books. Mr. Rathbone asked whether they did not raise their price in selling their goods, consequent upon the rise in raw material. To that he would say that very often they had to make contracts in advance for a long period. If they made a contract in advance when rubber was 5s. or 6s. a lb. and the price went up, they could easily see how they were hit. It was almost impossible to avoid being hit by the contract system with changing prices. But really that was not the way in which they had been hit seriously. The way in which they had been most seriously hit was that with the price of rubber advancing, they had to go on manufacturing, and they had to put 12s. 6d. rubber into their manufactures. It was often three or four months before those materials could be sold, and therefore they had in stock a large amount of material with rubber in it which cost them 12s. 6d. a lb. When the price fell, all the different manufacturers got nervous as to the fall continuing, and as to the danger of maintaining those stocks. They had to bear in mind that the longer they kept a stock manufactured at a high price, the greater the loss when they had to sell if they held it back. They could not sell under those circumstances, according to the market price, if they were not to be hit with a still bigger loss in the future. If all the manufacturers had agreed to keep up their prices for some little time after the fall in rubber, so as to get a profit, they would have been all right, but it was impossible to get such a combination, and the only possible course to adopt was to sell at market prices for fear of further greater losses. Mr. Verey spoke of profits they ought to have made when prices were rising, but there again they came in contact with the optimism of the trade. Personally, he believed they would have been better off if, two years ago, they had maintained higher prices and reduced their sales considerably. It was, however, a bold course to adopt—to reduce their sales, perhaps by from 20 to 30 per cent., by raising their prices. Mr. Furse had said there were many companies doing a similar trade to theirs which had made a large profit. He (the chairman) would very much like to know the names of some of those firms. He dared say there were such companies, but he would like to know them. The chairman then read an extract from the speech of Mr. Du Cros at the Dunlop Tyre Co.'s meeting, to show the disastrous effects which had been produced by the high price of rubber.

Mr. Furse said he was referring to cable companies.

The Chairman said he would be glad to hear the names of rubber cable-making companies which had made a profit last year. With regard to the turnover, measured by bulk, it was larger now than it had ever been before, or just as large. As far as the turnover was concerned, they had nothing whatever to fear—they were doing as big a business as ever, the question was the difficulty of making profits. Mr. Atkinson asked about the reserve fund, and whether it was possible to utilise it for the purpose of paying dividends. They had done that this year for the purpose of paying the preference dividend; but, of course, it was a policy that they could not carry very far without becoming short of cash. Mr. Charrington had spoken of the rates. Well, they were always with them, and he suggested that they should move their works to the country, if they could possibly do so. Those who had any knowledge of a manufacturing company would know that it was an exceedingly difficult thing to up-root a manufactory from one place and take it to another, but the board had had that possibility in view. As to paper and jute insulation, that had got to be looked at from a manufacturing point of view. It was not possible to start every line, and they had believed up till now that the profit on paper-covered cables was very small, but they would consider whether they ought to develop that line of trade or not. Mr. Foster spoke about the shares which they held in other companies. As he (the chairman) had already explained, by far the largest amount was in the Palmer Tyre Co., and as that was entirely in their own hands, there was no market quotation for the shares. The other company was in a similar position, for they practically owned the whole of the shares, and there again they were not quoted on the market, and no auditor could put a value on them. He could only give them his own opinion, which was that the shares, if anything, stood at less than their real value. That was his honest belief. Mr. Ware asked about the 150 miles of cable, which he referred to as an old friend. That cable had been sold to the French Government, and had been paid for. One shareholder had complained that he had said nothing as to the future. That was perfectly true, and therefore he would just like to say one or two words generally as to the future. They had the old question of the rates with them, and now they had the question of the Insurance Bill, and there was the price of cycle tires, which were not quite as satisfactory as they might be; but those were the kind of things which in an ordinary year they would not trouble about very much. He did not think that any of those circumstances need cause them any alarm. The only cause for alarm in the future was the unknown, and being unknown he could not say what it would be. There was always the possibility of another large rise in the price of rubber. He did not think it was likely to occur, but it was a possibility, and if it should occur—if there were any such circumstances as had occurred in the past—then they would still more seriously take into consideration the closing of their works if necessary. They would do more than that; they would take into consideration whether such circumstances could not be met by a combination between the various manufacturers refusing to buy rubber above a certain price; because the price to which it had gone at one time was not a fair price—it was quite a speculative price, and the only way to meet that would be to do the same as had been done in the cotton trade, viz., by combination between manufacturers to refuse to buy above a certain price. He did not think it was likely to occur, and, broadly speaking, he could only say that, looking to the future, they saw no cause for alarm. The past had been a disastrous year, and they had expressed their regret for it. That regret was sincere, and shareholders could, perhaps, understand his position at having to stand there and try and explain the losses they had suffered. He was deeply grieved at the past, but, on the whole, he looked forward with as much confidence to the future of that company as to the future of any manufacturing company in England. He saw no special difficulties ahead of them, and they must try to fight with such difficulties as there were, and he thought they would do so with considerable confidence as regarded the future, but with great regret as regarded the past.

The report was then adopted.

The meeting passed a very hearty vote of thanks to the directors, and also to the chairman for his conduct of the meeting.

Perth Electric Tramways, Ltd.—The directors state that the profits for the year 1911 show a very large increase over those of any previous year, and fully bear out the anticipation of the chairman, as expressed at the general meeting. Accordingly, they have declared an interim dividend upon the ordinary share capital of 6d. per share, free of income-tax, for the first half of the year, being at the rate of 5 per cent. per annum, payable on January 1st next, on which date the warrants will be posted. The ordinary share transfer books are closed from December 16th to 30th.

Costa Rica Electric Light and Traction Co., Ltd.

The directors' report for the year ended June 30th, 1911, shows that the net earnings in Costa Rica, after charging all expenses incurred, amounted to £18,451, as compared with £14,530 for the previous year. These figures are conservative, and have been arrived at after writing down by a substantial sum stock values and other items appertaining to the concessions. The volume of business exceeded that of the previous year by approximately £4,800, a sum largely made up by increased earnings in the tramway department. The number of lamps installed in the lighting department also increased about 16 per cent. during the 12 months, and the motor supply by 52 H.P. To obtain this result the station plant was worked at overload and at considerable risk throughout the year, no assistance having been rendered by the new station. The first section of the new power station at El Brasil, some 12 miles from the capital, is now completed, and the manager hopes to inaugurate a supply to the public during the present month. This section consists of three hydro-electric sets of 500 KW. capacity each, with one pipe line capable of supplying power for two of them, together with switchboard, transformers and pole-lines, and a sub-station adjoining the old power house at Los Anonos, two miles from San José. To complete the station, and utilise to its full extent the hydraulic force now at the company's disposal through the installation of the dam, tunnel, aqueducts and tanks, there will be required a further three 500-KW. sets and two extra pipe lines, with transformers and pole lines to correspond. This extension will raise the switchboard capacity of the power house to nearly 3,000 KW. The directors are advised that for safety's sake they should install, without any avoidable delay, at least a second pipe line and a fourth unit of plant, as in case of accident to the single pipe the entire station would be out of action. The whole of the £100,000 prior lien bonds authorised by the debenture-holders for tramway extensions and for the development of the Brasil water-power to its present extent, have been issued. Owing to engineering difficulties beyond the control of the management, encountered in connection with the piercing of the tunnel, the construction of the dam and other items, the cost of the work has not been entirely covered by the amount received from the issue, and the directors have arranged for a temporary advance of a further £10,000 on the collateral security of the unissued 5 per cent. debentures (£52,900). The directors have appointed as general manager in Costa Rica (in succession to the late Mr. G. Holt Green) Mr. William Norman Brand. This gentleman, who has had considerable experience in a similar capacity in Argentina, took up his duties on February 21st last, and the board are satisfied with his energy, capacity and tact, and his devotion to the company's interests. During the year the gold premium has averaged 113 per cent., as against 110 per cent. for the previous year, The general manager certifies that all buildings, machinery, plant, &c., have been kept in good working order. The insurable buildings, machinery and rolling stock are adequately covered against risk from fire, except the buildings and machinery at Brasil, on which insurance will be effected as soon as particulars are to hand.

The annual meeting of the shareholders of the above company was held on Wednesday at the offices, Dashwood House, Old Broad Street, E.C. We are unable to give a report of the proceedings, as the representative of the Electrical Review was informed that the meeting was not open to the Press.

Manx Electric Railway Co., Ltd.

Colonel Sir A. G. Boscawen, M.P. (chairman), presided on Tuesday at the offices, 3, Finch Lane, E.C., over the ninth ordinary general meeting of the above company.

The Chairman, in moving the adoption of the report, said they had behind them an exceptionally fine summer, and the result of their efforts proved that, given such favourable conditions, the railway was as attractive and as well able to earn revenue as ever, in fact, better; for both the number of passengers carried, and the gross revenue earned, constituted a record. The passengers totalled 606,497, as against the previous best of 546,666 in the year 1906-7, and against 533,104 last year. The gross revenue amounted to £36,013, as against the previous best of £35,345 in 1906-7, and against £32,581 last year. The passenger mileage, on the other hand, was only 344,968, as compared with 360,079 in 1906-7, which showed that they had by no means lost sight of the necessity of economical working even in times of bumper traffics. Of course, as compared with last year, when they carried over 73,000 fewer passengers, they had had a considerable increase in passenger mileage, in fact, 15,030 miles, but that was only natural. The traffic receipts per mile were this year 1s. 9·34d., as against 1s. 8½d. last year; per passenger carried 12·88d., as against 13·2d., and the passengers carried per train-mile showed 1·76 this year, as against 1·61 last year. The reduced figures per head carried went to prove what was also clearly demonstrated by their traffic statistics, namely, that the increased number of passengers carried consisted mainly of short-distance travellers. On the expenditure side they showed this year a total of £17,214, as against £17,310 last year, and £16,772 in 1906-7. The ratio of working expenses to receipts was 47·78 per cent. this year, against 53·12 per cent. last year. Their reserve account at the beginning of the year under review stood at £5,317, represented by investments costing them £5,174, at which amount they stood in their books, and a small balance in cash, nothing having been added to it for the last two years except the interest earned thereon this year, amounting to £147, and bringing the total reserve to £5,463. They now proposed adding the sum of £1,500 thereto. At present market prices their investments were valued at £5,313. They had paid an interim dividend of 2½ per cent. on the 5½ per cent. cumulative preference shares, and proposed paying a final dividend of 2¾ per cent. thereon, which would leave a sum of £1,375 to be carried forward to new account. The island generally had had a prosperous season, the total of arrivals at Douglas for the five months—May to September—aggregating 540,067, which again constituted a record, and was 71,796 above last year. Ramsey, on the other hand, showed a decrease of 1,532, but then there were no Territorials this year, whereas last year there were 3,451. Peel also had a decrease of 6,451, owing entirely to the absence of Territorials, who last year counted 7,090. The railway and shipping strikes undoubtedly had a deleterious influence on arrivals during a short time in August, for the boat service between Liverpool and Douglas was seriously affected from August 15th to the 20th. Many people who might otherwise have prolonged their stay, hurriedly left the island for fear of not being able later on to return, and intending visitors were altogether prevented from crossing from Liverpool to Douglas. The arrivals in the island on Saturday, August 19th, numbered only about 3,000, instead of the usual figure of 24,000 at that period in previous years. Their own week ending August 23rd, showed a decrease of £147 in passenger revenue as compared with the corresponding week last year, whereas in view of the beautiful weather they might under normal conditions easily have experienced a big increase.

Mr. B. E. Greenwell seconded the motion.

Mr. Owen said he was one of the unfortunate holders of ordinary shares, and, with such a season as they had had, he thought they would have seen a profit, if ever they were to have one. Naturally, he felt disappointed, and would like to know if the chairman could give them any idea of whether there was a chance of improving in any way, for it was certain they would never get a better summer. If there was not, he wondered whether the directors would be generous enough to take compassion on the shareholders and reduce their fees, so that, at all events, there might be a chance of the ordinary shareholders getting 1 per cent.

The Chairman said, naturally the board would have been glad to have declared a dividend, and it was true that the last season was a fine one. But they had had two bad years previously, during which nothing was added to the reserve, whilst last year, also, they brought forward only £236. They were bound, therefore, to use the profits to make up the reserve, and to carry something more forward. He did not wish to hold out the idea that there was no prospect for the ordinary shareholders—far from it, for when they had built up the reserve the position would be very different. When the reserve had reached a certain figure the interest on it would lead to its increase year by year, and then, if they had fine summers, there was no reason whatever why they should not be able to pay an ordinary dividend.

The report was then adopted, and the retiring director re-elected.

British Electric Traction Co., Ltd.—The *Financial News* states it is announced that the resignations of the directorships of Sir Charles Rivers-Wilson and Sir Charles W. Fremantle have been accepted.

Eastern Telegraph Co., Ltd.—The directors announce a lividend (payable on January 15th) at the rate of 3½ per cent. per annum, less income-tax on the preference stock for the quarter ending December 31st, and the third quarterly interim dividend of 1¼ per cent. on the ordinary stock, free of income-tax, in respect of profits for the year 1911.

Hobart Electric Tramway Co., Ltd.—The directors have declared an interim dividend at the rate of 2½ per cent., free of income-tax.

STOCKS AND SHARES.

Tuesday Evening.

Markets are, of course, in holiday mood, but this did not stop a fair amount of business in the earlier part of the week. In fact, orders came in satisfactorily enough; and in spite of the interruptions offered by innumerable charitable appeals, members as a rule managed to make their expenses before the Christmas recess, which this year is an unusually long one.

The unrest in the railway world continues to provide the principal lever with which prices are manœuvred up or down. Although the fear of a general strike next week is removed, it is obvious that the railwaymen are far from being satisfied with the result of the Conference between their leaders and the railway companies; while the threatening aspect of the crisis which arose in the coal trade made an added cause of depression. Steam stocks, therefore, have been a great deal subdued, and this reacted upon electrical issues. City and South London rose superior to the prevailing dulness, it being expected that the holiday traffics on this line would be more dense than ever. Metropolitans, however, fell ¾, while Districts rose ¼. It is said that arrangements are being made for the Piccadilly Tube to be extended to Ealing in order to meet the competition of the Great Western and Central London. A few of the prior securities in this department are firmer, District Debenture stocks being particularly noticeable in this respect. Underground United 6 per cent. Income bonds continue to improve, the price having hardened to 67 middle.

Metropolitan Electric Tramways Deferred shares have come on offer, and the price eased off to 3a. 1½d. Dealings in British Electric

Tractions have marched to something like a state of confusion, because the company's books close at the end of this week for a month, and upon their reopening there will be a distribution of the new securities to the Ordinary and Preference shareholders. In the market the arrangement is not at all relished. For one thing, holders will be given stock instead of shares, and stock is generally less easy to deal in. This may be exemplified by the case of the River Plate Electric Company, where the turning of thes hares into stock has had the result of reducing transactions to almost a minimum; whereas in the old days there was always a more or less free market in the shares. On the week there are no quotable changes in British Electric Traction issues, and some of the dealers complain that it will be impossible to have any sort of a free market, at all events, until about the middle of February.

Good must be the wind that hurts nobody, and the announcement that the Capital of India is to be changed from Calcutta to Delhi brought about a sharp fall in the prices of Calcutta Electric Supply Ordinary and Calcutta Tramways Ordinary, both losing 10s. These declines do not represent the full extent of the fall that took place at the end of last week, some recovery having been made since the announcement. We must say that the selling appears to us to have been distinctly unnecessary, to put it mildly. Calcutta, after all, is not going to be relegated to the background, and its streets given over to rubber plantations. It is quite conceivable that, under the new arrangements, Calcutta will go ahead more progressively than she has done in the past, and this aspect ought to carry weight with those who are still tempted to realise their shares upon what looks very much like a mere scare.

Other Colonial and Foreign Supply issues are steady, the especial feature being a fresh rise in Montreal Light, Heat and Power, whereby the price has been carried up to all but 200. The rise in the price of this stock is one of the features of the year, the lowest price having been 144, and the last 20 points having been put on in about a couple of months. Shawinigan water has hardened a little, and Kaministiquia bonds are ½ higher.

The Latin-Canadian group, as a whole, is very firm as regards the pre-ordinary issues. Some of the Common shares are easier—Mexican Trams, for instance, having lost 2 points, Rio Trams ½, and so on. Brisbane Trams Ordinary at 8⅜ have improved a little, and the British Columbia descriptions are a trifle irregular.

Victoria Falls Power Preference have gone back to 15s., and the drought which has been prevailing over South Africa is said—though with what truth we have not been able to trace—to be exercising a serious effect upon the company's undertaking. The South African market as a whole is under a heavy cloud, and it may be that Victoria Falls shares justify their name simply in sympathy with the rest of the market. There are, however, disquieting rumours about; and although to rush into print is seldom a wise proceeding on the part of directors of any concern, this may be one of the exceptional cases in which a statement of the actual position of affairs might be fully justified on the real cause for anxiety which shareholders in the company have, by reason of the long-continued drought.

Marconi shares monopolise nearly all the attention in the Telegraph section, and the prices of the Ordinary and Preference have both improved 5s. The Ordinary changed hands as high as 59s. 6d., a huge account having been built up in them. Anglo-American Telegraphs are harder, and American Telephone and Telegraph Capital stock put on 1. New York Telephone bonds have been bought by some of the finance houses on this side. National Telephones are a little better, the Deferred stock having recovered most of its 2-point fall of last week. A few *ex*-dividend markings have taken place, but the great number comes, of course, at the end of the year.

Manaos Trams and Lighting Ordinary shares—which, it will be remembered, were introduced to the market some few weeks ago at 14s. and were taken up to 16s.—have just been undergoing their special settlement. Upon this, some of the speculative buyers hastened to take what profit they could get, in view of the fact that carry-over facilities were not offered, and the price receded to 14s., to rally later to 15s. 6d. New issues as a whole are maintained at about their prices of last week. South American Light and Power, for instance, are 2½ premium; Puebla Trams, 1½ discount; Mexican Light and Power Second Debentures, ⅝ discount. A number of others are promised immediately the new year begins, when money is expected to rule more cheaply, and the release of dividends will offer company promoters a hope that the public appetite will be rather more keen for fresh investments than it was during the rush of new issues a week or two ago.

London Lighting companies' stocks and shares are very firm, but prices have not moved much. The chief feature is the rise of ¼ in County of London Ordinary shares, still on the expectation of an increase in the dividend in respect of the current half-year. Chelseas are up ¼. London Electrics regained their 5s. fall, and South Metropolitan Preference continued to be bought, the price hardening to 1$\frac{1}{16}$. St. James', on the other hand, are ¼ off.

In the Manufacturing group there has been no recovery in India-rubber shares after their heavy fall, and dealings in the Ordinary are for the time being largely a matter of negotiation, on the basis of £10 middle. Brush Debenture stocks have attracted a little attention, and the Firsts rose a point. Edison 4 per cent. Debenture at 73 is better to the same amount. The Rubber market has shown further vivacity, with prices on the rise. It is declared that the demand from American manufacturers for the raw material shows a considerable expansion, but this is a report which is not altogether in its first youth. However, rubber shares have no doubt fallen upon levels that render them attractive-looking to the speculative investor for the sake of the yields which they offer, and it is this factor more than mere gambling which has been responsible for the increased activity in the market.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, December 20th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	„	28/-	..
a „ Sulphuric	„	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (crystal)	per ton	£29	..
a „ „ „	„	£30	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16	..
a Ferro-Silicon (50 %)	„	£11 10	..
a Copper Sulphate	„	£20	..
a Lead, Nitrate	„	£25 10	..
a „ White Sugar	„	£22 15	..
a „ Peroxide	„	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a „ Chlorate	per lb.	3½d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide	„	7d.	..
a Shellac	per cwt.	68/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5 5	..
a Soda, Caustic (white 70 %)	„	£11	..
a „ Chlorate	per lb.	3⅝d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
a „ Cyanide (basis 100 %)	„	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£68	£3 inc.
b „ Wire, in ton lots	„	£102	..
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£38 10 £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7⅝d.	⅛d. dec.
c „ Tube (brazed)	„	9⅛d.	⅛d. inc.
c „ „ (solid drawn)	„	8d.	⅛d. inc.
c „ Wire, basis	„	7⅜d.	⅛d. inc.
c Copper Tubes (brazed)	„	10⅜d.	⅛d. inc.
c „ „ (solid drawn)	„	9⅜d.	⅛d. inc.
g „ Bars (best selected)	per ton	£79	£4 inc.
g „ Sheet	„	£79	£4 inc.
g „ Rod	„	£79	£4 inc.
e „ (Electrolytic) Bars	„	£65	£4 10 inc.
e „ „ Sheets	„	£82	£4 10 inc.
e „ „ Rods	„	£70	£5 inc.
e „ „ H.C. Wire	per lb.	9d.	⅛d. inc.
f Ebonite Rod	„	5/3	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/11	..
h Gutta-percha, fine	„	5/- to 7/-	..
h India-rubber, Para fine	„	4/3½	1½d. inc.
i Iron Pig (Cleveland warrants)	per ton	49/7½	1d. dec.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	per ton	£15 17 6 to £16	1/- dec.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£8 2 6	..
d Mica (in original cases) small	per lb.	6d. to 2s.	..
d „ „ „ medium	„	2/6 to 4/-	..
d „ „ „ large	„	4/6 to 8/6	..
p Phosphor Bronze, plain castings	„	11d.	..
p „ „ rolled bars & rods	„	1/0½	..
p „ „ rolled strip & sheet	„	1/1	..
o Platinum	per oz.	185/-	..
e Silicium Bronze Wire	per lb.	9⅜d.	1d. inc.
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£203 to £204	2s.
n „ Wire, Nos. 1 to 16	per lb.	2/4	1d. inc.
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh't (Vieille Montagne bnd.)	„	£31 2 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

British Columbia Electric Railway Co., Ltd.—Further issue of £200,000 deferred ordinary stock; £200,000 preferred ordinary stock; and £200,000 5 per cent. cumulative perpetual preference stock.

The Committee has appointed a special settling day as under:—

Friday, January 5th.—Toronto Power Co., Ltd.—Scrip, fully and partly paid, for £821,917 4½ per cent. consolidated guaranteed debenture stock.

And ordered the undermentioned securities to be quoted in the Official List:—

Montreal Water and Power Co.—Further issue of £20,000 4½ per cent. first mortgage prior lien gold bonds of £100 each (Nos. 8,298 to 8,497).

Toronto Power Co., Ltd.—Scrip, partly paid, for £821,917 4½ per cent. consolidated guaranteed debenture stock.

Tri-State Railway and Electric Co.—$668,000 first mortgage and collateral trust 50-year 6 per cent. gold bonds of $1,000 each (Nos. 1 to 668).

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Dec. 19th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord.	10	5½	5†	7⅞ — 8⅛	..	6 5 9
Do. 4½ % Pref.	10	4½	4½	8⅞ — 9¼	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10⅜ — 11	..	5 9 1
Do. 4½ % Deb. Stock	Stock	4½	4½	101 —103	..	4 7 5
Brompton & Kensington, Ord.	5	10	9†	7⅝ — 8⅛	..	5 19 4
Do. 7 % Cum. Pref.	5	7	7	7⅞ — 8	..	4 7 6
Central Electric Supply, 4 % Guar. Deb.	100	4	4	98 —101	..	3 19 3
Charing Cross, West End & City	5	5	5†	3⅜ — 4	..	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅞	..	4 12 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4⅛	..	5 5 11
Do. Do. 4 % Deb.	100	4	4	98 — 96 xd	..	4 3 4
Chelsea, Ord.	5	5	4†	4 — 4½	+ ⅛	5 11 1
Do. 4½ % Deb.	Stock	4½	4½	99 —102	..	4 8 3
City of London, Ord.	10	7	6†	12⅜ — 13½	..	5 6 8
Do. 6 % Cum. Pref.	10	6	6	12 — 13	..	4 12 4
Do. 5 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb.	100	4½	4½	101 —104	..	4 6 7
County of Durham, 5 % First Mort. Deb.	Stock	5	5	89½ — 91½	..	5 9 3
County of London, Ord.	10	5	4†	8⅞ — 9⅜	+ ⅛	5 6 8
Do. 6 % Pref.	10	6	6	11 — 11½	..	5 4 4
Do. 4½ % Deb.	Stock	4½	4½	108 —110	..	4 1 10
Do. 4½ % Second Deb.	Stock	4½	4½	100 —103	+1	4 7 5
Edmundson's, Ord.	5	Nil	Nil	⅜ — ½	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	2 — 2½	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	+1	5 4 8
Folkestone	5	6	6†	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	95 — 98	..	4 11 10
Hove	5	9	8†	6⅞ — 7½	..	6 4 2
Kensington & Knightsbridge, Ord	5	9	8†	6⅞ — 7½	..	6 4 2
Do. 4 % Deb.	Stock	4	4	94 — 96	..	4 3 4
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	3	2	..	1½ — 2	+ ⅛	3 0 2
Do. 6 % Pref.	5	6	6	4½ — 4⅝	..	6 3 1
Do. 4 % First Mort. Deb.	Stock	4	4	87 — 90 xd	..	4 8 11
Metropolitan	5	5	4†	3½ — 4	..	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	4 14 9
Do. 4½ % First Mort. Deb.	Stock	4½	4½	101 —106	..	4 4 11
Do. 3½ % Mort. Deb.	Stock	3½	3½	85 — 88	+ ⅛	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96½ — 98½	..	4 11 5
Newcastle-on-Tyne	5	4	4†	3½ — 4	..	5 0 0
Do. 5 % Pref., Non-Cum.	5	5	5	4 — 4½	..	5 11 1
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	..	4 18 0
Notting Hill, 6 % Non-Cum. Pref.	10	..	..	10 — 11	..	..
Oxford	5	7½	6†	6½ — 6⅞	..	5 9 5
St. James' and Pall Mall, Ord.	5	10	10†	7⅜ — 8½	..	6 1 8
Do. 7 % Pref.	5	7	7	6⅝ — 7⅜	— ⅛	4 19 1
Do. 3½ % Deb.	100	3½	3½	86 — 88	..	3 19 7
Smithfield Markets, Ord.	5	Nil	..	1⅜ — 1½	..	Nil
South London, Ord.	4	5	..	2⅜ — 3½	..	6 3 1
Do. 5 % First Mort. Deb.	100	5	5	99 —100	—2	5 0 0
South Metropolitan, 7 % Pref.	1	7	7	1 — ⅛	+ 1/32	6 4 5
Do. 4½ % First Deb. Stock	100	4½	4½	95 — 98	..	4 11 10
Urban, Ord.	5	5	..	½ — ⅝	..	..
Do. 5 % Cum. Pref.	5	5	..	2 — 2½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	86½ — 88½	..	5 1 8
Westminster, Ord.	5	10	10†	7⅞ — 8⅜	..	5 19 5
Do. 4½ % Cum. Pref.	5	4½	4½	5 — 5¼	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5½ — 5⅝	..	5 4 4
Calcutta, Ord.	5	8½	7†	6 — 6⅛	— ⅛	6 10 9
Do. 5 % Pref.	5	5	5	5 — 5¼	..	4 15 3
Calgary Power, 1st Mort. Bds.	100	5	5	96½ — 98½	..	5 1 6
Canadian Gen. El. Com.	$100	7	7†	110 —115 xd	..	6 1 9
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	3†	⅞ — 1	..	3 0 0
Do. 5 % Deb.	100	5	..	94 — 97	..	5 3 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	91 — 93 xd	..	6 9 0
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	84½ — 87½	..	5 14 3
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	90½ — 92½	..	5 8 1
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/16 — 5/16	..	Nil
Do. 6 % Pref.	1	6	6	⅞ — 1	+ 1/32	8 0 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	102½ — 104½	+ ½	4 15 8
Madras, Ord.	5	..	..	2⅝ — 3⅛	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	100 — 102	..	4 18 0
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	88 — 90	..	5 11 1
Mexican Lt. & Power, Common	$100	4	4†	87½ — 89½	— ½	4 9 5
Do. 7 % Cum. Pref.	$100	7	7	107½ — 109½	..	6 7 10
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95 — 97	— ½	5 3 1
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Montreal, Lt., H. and Power	$100	7	8	196 —200	+4½	3 10 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	..	41 — 43	..	11 12 6
River Plate, Ord.	Stock	10	..	238 —243	..	4 2 4
Do. 6 % Non-Cum. Pref.	Do.	6	6	104 —110	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	102 —104	..	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital	$100	4	5†	125 —127	+1	3 3 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	102½ — 104½	..	4 6 2
Toronto Power, 4½ % Deb.	Do.	4½	4½	98 —100 xd	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92 — 94	..	5 6 5
Victoria Falls Power, Pref.	1	Nil	11¼d.	1/16 — 1/8	—1/16	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106½ — 108½	..	5 10 7

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	4†	7 — 7½	..	..
Do. 5 % Deb. Red.	Stock	5	5	99 —101	..	4 19 0
American Telep. & Teleg., Cap.	$100	8	8†	143 —145	+1	5 10 4
Do. Collat. Trust	$1000	4	4	95 — 97	..	4 2 6
Anglo-American Telegraph	Stock	8⅝	3†	6⅝ — 6⅞	..	5 9 6
Do. 6 % Pref.	Do.	6	6	110½ — 111½	..	5 7 7
Do. Def.	Do.	30/-	..	25⅝ — 26⅜	+ ⅛	5 14 3
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	..	4 17 1
Chili Telephone	5	7	..	7 — 7½	..	4 16 7
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	86 — 88	— ½	4 10 11
Cuba Telegraph	10	6	6†	10 — 10⅜	..	5 11 7
Do. 10 % Pref.	10	10	10	17 — 18	..	5 11 1
Direct Spanish Telegraph, Ord.	5	4	4†	3⅛ — 3⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	8⅞ — 9⅜	..	5 14 3
Do. 4½ % Debs.	50	4½	4½	100½ — 102½	..	4 7 10
Direct United States Cable	10	4½	..	7⅝ — 8⅛	— ⅛	5 10 9
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	100 —102	+ ½	4 8 3
Eastern Telegraph, Ord. Stock	Stock	7	5†	137½ — 140½	+ ½	4 19 8
Do. 3½ % Pref. Stock	Do.	3½	3½	83½ — 85½	..	4 1 10
Do. 4 % Mort. Deb.	Do.	4	4	100½ — 102½	..	3 18 1
Eastern Extension	10	7	5†	13⅜ — 13⅝	+ ⅛	5 1 10
Do. 4 % Deb.	Stock	4	4	100½ — 102½	..	3 18 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	99 —101	..	3 19 3
Globe Telegraph and Trust	10	5⅞	6†	10⅜ — 11½ xd	..	5 6 8
Do. 6 % Pref.	10	6	6	12½ — 13½ xd	..	4 10 9
Great Northern Telegraph	10	18	5†	37½ — 38½	..	5 8 3
Indo-European Telegraph	25	18	5†	56 — 58	..	5 12 1
Mackay Companies Common	$100	5	5†	82 — 85 xd	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	73 — 76 xd	..	5 5 3
Marconi's Wireless Telegraph	1	5	..	2⅞ — 3	+ ⅛	..
Do. 7 % Cum. Partic. Pref.	1	16	..	2⅝ — 2¾	+ ⅛	..
Monte Video Telephone, Ord.	1	6	6	1/16 — 1/8	..	5 12 11
Do. 5 % Pref.	1	5	5	1/16 — 1/8	..	5 6 8
National Telephone, Pref.	Stock	6	6†	103½ — 105½	..	5 13 9
Do. Def.	Do.	6	6†	121½ — 123½	+ ½	4 16 9
Do. 6 % Cum. 1st Pref.	10	6	6	9⅝ — 10⅜	..	5 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅝ — 10⅜	+ ⅛	5 14 3
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5¼ — 5⅝	..	4 10 11
Do. 3½ % Deb.	Stock	3½	3½	99 —101	..	3 9 4
Do. 4 % Deb.	Do	4	4	99 —101	..	3 19 3
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	100⅜ — 101⅜	— ⅛	4 8 5
Oriental Telep. and Elec.	1	8	..	1⅜ — 1⅝	..	4 18 6
Do. 6 % Cum. Pref.	1	6	6	1⅜ — 1⅝	..	4 18 8
Do. 4 % Red. Deb.	Stock	4	4	88½ — 90½	..	4 8 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	100 —102	..	3 18 5
Reuter's	8	5	5†	8⅜ — 9¼	..	4 6 6
Submarine Cables Trust	Cert.	6	6	130 —133	..	4 10 3
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	100 —102	..	4 8 3
United River Plate Telephone	5	8	8	7¼ — 7½	..	5 6 8
Do. 5 % Cum. Pref.	5	5	5	5¼ — 5½	..	4 10 11
West Coast of America	2½	2½	2½	1/16 — 1/8	..	4 15 3
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	99 —101	..	3 19 3
West India and Panama Teleg.	10	1½	1½†	2⅜ — 3	..	4 3 4
Do. 6 % Cum. 1st Pref.	10	6	6	10 — 10½	..	5 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅝ — 10¼	..	5 17 1
Do. 5 % Debs.	100	5	5	103 —105	..	4 15 8
Western Telegraph, Ltd.	10	7	6†	13⅜ — 14⅝ xd	..	5 0 11
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 17 8
Western Union Tel., 4 % Bnds. A	$1000	4	4	106 —109	..	3 13 5
Do. 4½ % Fdg. Bonds	$1000	4½	4½	100 —103	..	4 7 5

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Dec. 19th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	⅛ — ¼	..	Nil
Do. 5 % Pref.	1	5	5	⅜ — ½	..	6 18 4
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11
Brit. Elec. Trac., Ord.	10	Nil	Nil	¾ — 1⅛	..	Nil
Do. 6 % Pref.	10	1½	1½	5⅝ — 6⅛	..	3 8 7
Do. 5 % Deb.	100	5	5	92 — 95	..	5 5 8
Do. 4½ % 2nd Deb.	100	4½	4½	78 — 82	..	5 9 9
Central London Railway, Ord.	100	3	3†	67 — 69	..	4 5 9
Do. Pref.	100	4	4	84 — 86	..	4 13 0
Do. Def.	100	2	..	50 — 52	..	3 18 5
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 11
City & South London, Ord.	100	1½	1½†	30½— 31½	+ ½	4 15 3
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	103 —105	..	4 15 8
Do. Do. 1903	100	5	5	102 —104	..	4 16 2
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
Dublin United Trams, 6 % Pref.	10	6	6	11 — 12	..	5 0 0
Great Northern & City, Pr'f. Ord	10	Nil	..	1 — 1½	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	3†	⅛ — ¼	..	Nil
Do. 4½ % Deb.	100	4½	4½	73 — 78	..	5 14 8
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2⅜ — 2⅝xd	..	4 6 11
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	79 — 82	..	6 1 11
London Elec. Railw'ys, 4 % Deb.	100	4	4	97 — 99	..	4 0 10
London United Trams, 5 % Pref.	10	Nil	..	2⅝ — 3⅛	..	Nil
Do. 4 % Deb.	100	4	4	70 — 74	..	5 8 1

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Dec. 19th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Metropolitan Railway Consol.	100	1⅜	2†	43¼— 43½	— ⅜	3 3 3
Do. Surplus Lands	100	2⅜	3†	66 — 68	..	4 0 11
Do. 3½ % Deb.	100	3½	3½	89 — 91	..	3 17 0
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	..	31½ — 32	+ ½	Nil
Do. 6 % Deb.	100	6	6	145 —147	+1	4 1 8
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
Do. 4 % Prior Lien	100	4	4	100 —102	..	3 18 5
Do. 4½ % First Pref.	100	3½	4½†	88 — 90	..	3 12 3
Do. 3½ % Gtd.	100	3½	3½	75 — 77	+1	4 10 11
Metropolitan Elec. Trams, Ord.	1	5½	5†	33/32— 34/32	..	5 12 4
Do. Def.	1	Nil	..	7/32— 17/32	+ 3/32	Nil
Do. 5 % Pref.	1	5	5	3/32— 5/32	..	5 3 1
Do. 4½ % Deb.	100	4½	4½	102 —104	..	4 6 7
Do. 5 % Deb.	100	5	5	101 —103	..	4 17 1
Potteries, Ord.	1	2	..	7/32— 13/32	..	..
Do. 5 % Pref.	1	5	5	13/32— 19/32	..	6 19 3
Do. 4½ % Deb.	100	4½	4½	91 — 94	..	4 15 9
South Metro. Trams, 6 % Pref.	1	6	..	⅜ — ½	..	6 17 2
Do. 4 % Deb.	100	4	4	72 — 77	..	5 3 11
Underground Elec. Railways	10	..	..	1⅞— 2⅛	..	..
Do. 4½ % Bonds	100	4½	4½	100 —102	..	4 8 8
Do. 6 % Income	100	1	1½†	66 — 68	+1	1 9 0
Do. Power House Debs.	100	4	4	100 —102	..	3 18 5
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	Nil	..	2⅜ — 2⅝	..	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½†	5⅞ — 5⅝	..	4 14 1
Do. 2nd Pref.	5	5	5½†	4⅞ — 5⅛	..	4 18 9
Do. 4 % Deb.	100	4	4	95 — 97	..	4 2 6
Do. 4½ % Deb.	100	4½	4½	101½—103½	..	4 7 0
Do. 5 % Deb.	100	5	5	99 —101	+ ½	4 19 0
Auckland Trams, 5 % Deb.	100	5	5	104 —107	..	4 13 6
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅞— 11⅛	..	5 5 6
Do. 4½ % Deb.	100	4½	4½	98 —100	..	4 10 0
Do. 5 % 2nd Deb.	100	5	5	98½—100½	..	4 19 6
Brisbane Trams Invt., Ord.	5	8	8†	8⅝ — 8⅞	+ ⅛	4 12 9
Do. 5 % Pref.	5	5	5	4⅞ — 5¼	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	103 —106	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	8†	137 —142 xd	..	5 1 8
Do. Pref. Ord.	100	6	6	118 —122	—2	4 18 4
Do. 5 % Pref.	100	5	5	109 —112	..	4 9 8
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	+1	4 7 6
Do. 4½ % Vancouver Deb.	100	4½	4½	104 —106	..	4 4 11
Do. 4½ % Con. Deb.	100	4½	4½	101½—103½	— ½	4 7 0
Calcutta Trams, Ord.	5	6	..	5⅝ — 6⅝	— ⅛	5 6 8
Do. 5 % Pref.	5	5	5	5 — 5½	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
Cape Electric Trams	1	Nil	2½†	⅞ — 1	..	4 0 0
City Buenos Aires Trams (1904)	5	5	5	5⅜ — 5⅝	..	4 5 1
Do. 4 % Deb.	100	5	5	97 —100	..	5 0 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	98 — 98	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	102 —105	..	4 15 3
Kalgoorlie Elec. Trams	1	Nil	..	7/16— 9/16	..	Nil
Do. 5 % A Deb.	100	5	5	91 — 94 xd	..	5 6 5
Do. 6 % B Deb.	100	5	6†	58 — 62 xd	—2	8 1 4

La Plata Elec. Trms, Prf.	1	6	6	3/32— 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6†	1 — 1⅛	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	96 —100	..	5 0 0
Madras Elec. Tr. (1904), Deb.	100	5	5	96 — 99	..	5 1 0
Manaos Trams & Lt., 1st Deb.	100	5	5	93½— 95½	..	5 4 9
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100 —103	+ ½	4 18 0
Mexico Trams Com.	$100	7	7†	121 —123	—2	5 18 10
Do. Gen. Con. 5 % Bonds	..	5	5	98 —100	..	5 0 0
Do. 6 % Bonds	100	6	6	103 —105	+ ½	5 14 3
Para Elec. Rlys. & Lt., Ord.	5	10	10†	6⅞ — 7⅛	..	6 18 0
Do. 6 % Pref.	5	6	6	5⅝ — 5⅞	..	5 4 4
Do. 5 % 1st Deb.	100	5	5	97⅛ — 99⅛	..	5 0 6
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	⅞ — 1	..	2 10 0
Do. 5 % 1st. Deb.	100	5	5	101½—103½	..	4 16 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5¼ — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	98 —101	..	4 9 1
Rio de Janeiro Trams	$100	4½	5†	114½—115½	— ½	4 6 9
Do. 1st Mort. 5 % Bonds	..	5	5	103 —104	+ ½	4 16 2
Do. 5 % Mort. Bonds	100	5	5	96½— 97½	+ ½	5 2 10
Sao Paulo Tram, Lt. and P.	$100	10	10†	184 —188 xd	..	5 6 5
Do. 5 % 1st Deb.	$500	5	5	102 —104	..	4 16 2
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95½— 97½	..	5 2 7
Un. Elec. Trams Monte Video	5	6	7	5⅞ — 6¼ xd	..	5 2 2
Do. 6 % Pref.	5	6	6	5 — 6¼ xd	..	5 14 3
Do. 5 % 1st Deb.	100	5	5	99 —102	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	104 —106	..	4 4 11

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	⅜ — ½	..	..
Do. 6 % Pref.	1	9	6	32/32— 33/32xd	..	7 2 2
Babcock & Wilcox	1	26	24†	5⅞ — 6⅛	..	4 5 0
Do. Pref.	1	6	6	1⅜ — 1½	..	4 0 0
B.I. & Helsby Cables	5	10	8†	6⅞ — 7⅛	..	7 0 4
Do. Pref.	5	6	6	5⅞ — 6⅛	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 97	..	4 12 9
British Westinghouse, Pref.	3	Nil	..	¼ — ⅜	..	Nil
Do. Deb.	100	4	4	57 — 60	..	6 13 4
Do. 6 % Prior Lien	100	6	6	100 —102	..	5 17 8
Browett, Lindley, Ord.	1	Nil	..	1/6—2/-	..	Nil
Do. Pref.	1	Nil	..	5/- —6/-	..	Nil
Brush, Ord.	2	Nil	..	0 — ¼	..	Nil
Do. 7 % Pref.	2	Nil	..	0 — ¼	..	Nil
Do. 4½ % Deb.	100	4½	4½	56 — 61	..	7 7 7
Do. 4½ % Second Deb.	100	4½	4½	89 — 44	..	10 4 6
Callender's Cable	5	15	10†	9 — 9⅜	..	7 13 10
Do. Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
Castner-Kellner	1	17½	20	8⅜ — 8⅝	..	5 10 4
Do. Deb.	100	4½	4½	104 —108	..	4 3 4
Crompton & Co.	3	Nil	Nil	⅛ — ⅜	..	Nil
Do. Deb.	100	5	5	60 — 70	..	7 2 10

Dick, Kerr	1	5	..	⅜ — ⅝	..	5 14 3
Do. Pref.	1	6	6	1⅛ — 1⅜	..	5 12 11
Do. Deb.	100	4½	4½	96 — 98	..	4 11 10
Edison & Swan, A, £3 paid	5	Nil	..	½ — 1	..	Nil
Do. fully paid	5	Nil	..	1½ — 2⅜	..	Nil
Do. 4 % Deb.	100	4	4	71 — 75	+1	5 6 8
Do. 5 % Second Deb.	100	5	5	77 — 80	..	6 5 0
Electric Construction	2	Nil	2½†	⅝ — ¾	..	..
Do. Pref.	2	7	7	1⅜ — 1⅝	..	7 9 4
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8½	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	8⅝ — 9⅜	..	5 6 8
Do. Deb.	100	4	4	85 — 90	..	4 8 11
Henley's, Ord.	5	15	10†	11⅞ — 12⅜	..	5 18 10
Do. Pref.	5	4½	4½	4⅛ — 5⅛	..	4 5 11
Do. Deb.	100	4½	4½	104 —106	..	4 4 11
India-Rubber, G. & T.	10	10	..	9 — 11	..	..
Do. Pref.	10	5	5	9 — 10	..	5 0 0
Telegraph Construction	12	20	10†	35 — 37	..	6 7 5
Do. Deb.	100	4	4	100½—102½	..	3 18 1
Willans & Robinson	1	Nil	..	1/32— 1/16	..	Nil
Do. Pref.	5	Nil	..	⅛ — ¼	..	Nil
Do. Deb.	100	4	4	58 — 63	..	7 2 10

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

The yields are calculated upon the dividends paid for 1910.

Bank rate of Discount 4 per cent., September 21st, 1911.

THE FORMATION OF DEPOSIT BY TRANSFORMER OILS.

By HAROLD D. SYMONS, A.M.I.E.E.

The use of oil for cooling and insulating transformers has extended so rapidly that it is becoming increasingly necessary not only to carry out careful and systematic tests for the selection of an oil suitable for this purpose, but regularly to test consignments before they are put into service.

The tests for the usual physical and insulating properties have been dealt with by numerous writers, and it is not proposed to treat of these, except in so far as may be necessary from the point of view of the formation of deposit.

It has been known for some time that many oils used for transformer insulation form a deposit in service, but the matter was not considered of great importance until Mr. Peck called attention to it in the discussion on Messrs. Digby and Mellis's paper on "The Physical Properties of Switch and Transformer Oils."

This formation of deposit, or sludge, is an objectionable feature, and in some cases has been cited as the cause of breakdown. The reasons that have been put forward for its formation are:—(*a*) Collection of dust; (*b*) Solubility of insulating materials used in the construction of transformers; (*c*) Poor quality of oil. Under the term "poor quality of oil" are included any physical or chemical changes in the oil due to ageing.

Whilst dust may cause sludging where a transformer with badly-designed terminal gear is placed in a dirty situation, it is frequently of such a fine nature that it merely remains in suspension in the oil. A very small quantity of fine dust in oil is sufficient enormously to reduce brilliancy and render it more viscous. When the transformer is in use there will be a tendency for this dust to be deposited on the coils and in the ventilating ducts; but with recent designs of terminal gear and transformer tanks trouble arising from this source need not be feared.

The formation of sludge due to the use of insulating material soluble in mineral oils with present insulation design is impossible; oil-immersed transformers are insulated with fibrous materials treated with insulating varnishes. Micanite or built-up mica in any form is not, or, at any rate, should not be, used on oil-immersed transformers, though it is quite satisfactory for oil switches. The fibrous materials, whilst tending to absorb the oil, do not disintegrate, and the volume of varnish actually covering the insulating materials, compared with the volume of oil used, is negligible. The volume of varnish rarely equals 2 per cent. of the volume of oil, and in the majority of cases it is less than a half of 1 per cent. The volume of deposit must be considerable to cause trouble, and whilst the author has in some few cases found traces of resinous substances in the deposit, it has always been attributable to the use of either an air-drying varnish for finishing purposes or unsuitable cement used on the terminal gear. Also, a careful examination of the insulating materials used in the construction of the transformers from which the deposits were removed showed no loss or softening of the varnish upon them.

Most air-drying varnishes are soluble in oil, but the baking varnishes employed for transformer insulation, if thoroughly dried, are insoluble and unaffected by continued immersion in hot mineral oils. Some investigations on the sludge formed by oil in service have shown the presence of driers used in the manufacture of insulating varnishes, and fatty acids resembling those of the linoleic series, but the author would suggest that those were due either to fatty edges of varnish or insufficient drying, rather than to solubility of the varnish in oil. It is extremely doubtful, therefore, if the solubility of the insulating materials has ever been responsible for the formation of deposit in sufficient quantity to cause breakdown.

The oils must consequently be looked to as the cause of the formation of sludge, and as a preliminary experiment a sample of oil, flash point (closed) 180° C., was submitted to a temperature of 100° C. for four days; during this time it not only badly discoloured, but formed an appreciable deposit, small in quantity, but analogous to that found in transformers.

For the selection of a suitable oil for use with transformers, therefore, it became necessary to conduct a series

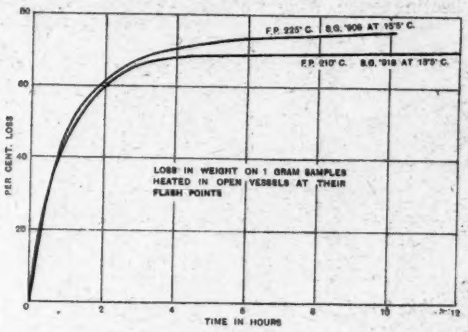

F.P. 225° C. S.G. '906 AT 15·5° C.
F.P. 210° C. S.G. '918 AT 15·5° C.
LOSS IN WEIGHT ON 1 GRAM SAMPLES HEATED IN OPEN VESSELS AT THEIR FLASH POINTS
PER CENT. LOSS
TIME IN HOURS

Fig. 1.

of experiments with a view to determining the best methods of testing an oil for the formation of deposit.

A number of oils were submitted to heating tests at various temperatures for varying lengths of time under different conditions; whilst it appeared that the temperature, time, and oxidation, were all factors in producing deposit, the temperature and the length of time it was maintained

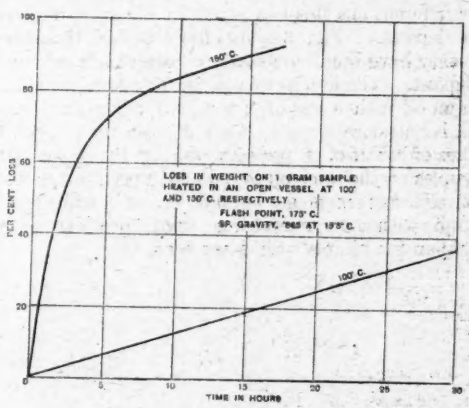

150° C.
LOSS IN WEIGHT ON 1 GRAM SAMPLE HEATED IN AN OPEN VESSEL AT 100° AND 150° C. RESPECTIVELY.
FLASH POINT, 175° C.
SP. GRAVITY, '865 AT 15·5° C.
100° C.
PER CENT. LOSS
TIME IN HOURS

Fig. 2.

affected the oil to a greater extent than oxidation. During the whole of the heating tests, observations of the loss in weight were periodically made. Figs. 1, 2 and 3 are typical of the results obtained, figs. 1 and 2 being the losses on 1 gramme samples, and fig. 3 on 70-gramme samples, under the standard conditions of test finally adopted. From

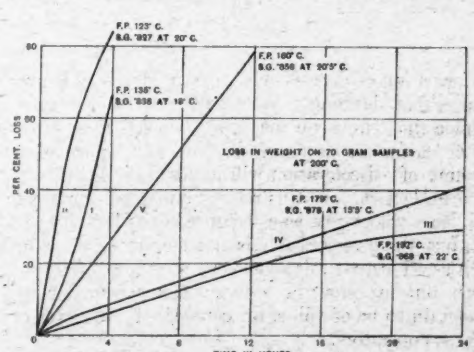

F.P. 123° C. S.G. '927 AT 20° C.
F.P. 160° C. S.G. '886 AT 20·5° C.
F.P. 138° C. S.G. '896 AT 15° C.
LOSS IN WEIGHT ON 70 GRAM SAMPLES AT 200° C.
F.P. 179° C. S.G. '875 AT 15·5° C.
F.P. 192° C. S.G. '868 AT 22° C.
I
II
III
IV
V
PER CENT. LOSS
TIME IN HOURS

Fig. 3.

these results it was apparent that the loss in weight was affected by the ratio of the volume of oil to the area of surface exposed. To determine the error that this would introduce, three different volumes of the same oil were heated in the same sized vessel at 100° C. Fig. 4 shows

the loss in weight of the three samples, and fig. 5 the loss calculated to a volume per unit area, from which it will be seen that the loss in volume from unit area is uniform over a fair range of time, when the volume is large compared with the area.

The following conditions were finally adopted as standard for all heating tests: Weight of oil 70 grammes, placed in a

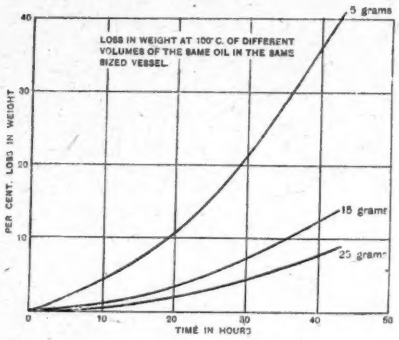

LOSS IN WEIGHT AT 100°C. OF DIFFERENT VOLUMES OF THE SAME OIL IN THE SAME SIZED VESSEL.
5 grams
15 grams
25 grams
PER CENT. LOSS IN WEIGHT
TIME IN HOURS

Fig. 4.

beaker 4 in. high and $2\frac{1}{8}$ in. in diameter. The ratio of volume of oil to area of surface exposed is large, the beaker sufficiently tall to prevent air currents unduly sweeping the surface of the oil, and, at the same time, not of such dimensions as to cause condensation of the vapour given off during heating tests. This renders the per cent. loss in weight comparative, but for different oils this loss is not a measure of the formation of deposit. Fig. 3 shows five oils, and the order in which they have been numbered indicates their tendency to form deposit. The loss in weight is, however, of value, for though an oil with a loss of 2 per cent. after six hours at 100° C. is not more likely to form deposit than an oil that has a loss of a half of 1 per cent. during the same test, if two samples of the same oil lose $\frac{1}{2}$ and 2 per cent. in weight respectively after six hours at 100° C., it is probable that the sample with a 2 per cent. loss would form deposit more readily than the sample with $\frac{1}{2}$ per cent.

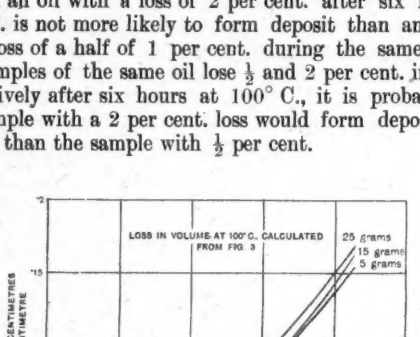

LOSS IN VOLUME AT 100°C. CALCULATED FROM FIG. 3
25 grams
15 grams
5 grams
LOSS IN CUBIC CENTIMETRES PER SQ. CENTIMETRE
TIME IN HOURS

Fig. 5.

The formation of deposit or sludge is always accompanied by considerable darkening in colour, loss in brilliancy and appreciable thickening of the oil. Indeed, the discoloration precedes the formation of deposit, and to some extent the amount of discoloration will indicate the liability of the oil to form deposit. In this respect an endeavour was made to establish a colour test as a measure of the liability to form deposit, but the deterioration is not merely a change of tint so much as an actual discoloration, and the difference not in depth but in colour of different oils rendered the tests too uncertain to be of value, or capable of being performed by different operators.

The discoloration is hastened, and even accentuated, by oxidation, but it is not merely the result of oxidation.

Unaccompanied by heat, oxidation produces no appreciable deterioration in any reasonable time.

With a given oil, a deposit may be formed by heating at a low temperature for many hours, or at a comparatively high temperature for a short time; the latter test is, of course, the more severe, but discoloration and formation of deposit will be produced when oxidation is impossible. The per cent. loss in weight on heating will vary with the flash point of the oil (see fig. 3), and should always be obtained. It is of value for comparing different shipments of the same oil, but the method of test must be definitely specified and remain constant.

The tests, therefore, to determine the liability of oils to form deposit must be so based as to render oils of different flash points capable of being compared. After numerous experiments, the author has adopted the following tests:—

1. Heat six hours at 100° C.
2. Heat one hour at 200° C.
3. Heat six hours at 10 per cent. above the flash point.
4. Heat four hours at 200° C.

As previously mentioned, the heating tests carried out by the author were on 70-gramme samples, in beakers 4 in. deep and $2\frac{1}{8}$ in. in diameter, and the samples were maintained within 5° C. above the temperatures specified. The time was calculated from the moment that the sample reached the specified temperature, the raising and lowering being rapidly accomplished with the comparatively small volumes used. The figures hereafter given are for samples tested under the foregoing conditions.

Test 1.—*Heating for Six Hours at* 100° *C.*—Heating a sample of oil at 100° C. is a test that has been adopted by many engineers for some time, though the length of time it is maintained, the per cent. loss and the conditions of test vary.

The following gives the loss in weight, and times that have been specified:—Six hours' loss not to exceed ·25 per cent.; eight hours' loss not to exceed ·3 per cent.; 12 hours' loss not to exceed ·5 per cent.

This test (1) has been fixed for six hours, since it does not, to any extent, determine the liability of an oil to form deposit, unless it is exceedingly poor in this respect, in which case some discolouration may take place. It is, however, when combined with the dielectric strength, of service in judging the oil as an insulator and its condition with regard to moisture. At the end of six hours at 100° C., there should be no appreciable change in colour, and the following gives the loss that may be expected with good insulating oils:—

Flash point,	180° C. and over,	less than	·25	%
,, ,,	165° C. to 179° C.	,, ,,	·5	%
,, ,,	155° C. to 164° C.	,, ,,	1	%
,, ,,	145° C. to 154° C.	,, ,,	1·5	%
,, ,,	135° C. to 144° C.	,, ,,	2·5	%
,, ,,	125° C. to 134° C.	,, ,,	3·5	%

Whilst there is still a fairly large margin of safety even with an oil with a flash point of 125° C., the situation of the transformer and conditions of service would need careful consideration before adopting an oil with a lower flash point.

(*To be concluded.*)

Electric Iron Ore Smelting.—As the result of experiments made at Trollhättan in the smelting of iron ore by electricity, it is stated that by means of circular instead of square carbon-electrodes, which can be screwed into each other, the electrode consumption per ton of pig-iron has decreased from 10·28 kg. (including the valueless end pieces) to 5·5 kg. By placing the charge more in the middle of the furnace the experimenters have succeeded in raising the percentage of carbonic acid up to 30 per cent. The consumption of electrical energy has decreased to 1,736 KW.-hours per ton of pig-iron, as compared with 2,391 KW.-hours in previous trials. The consumption of charcoal per ton of pig-iron, which during previous trials amounted to 418 kg. (the best result being 370 kg.), has now decreased to 336 kg., the amount originally estimated. Calculations based on these results show a saving of over 6 kr. (6s. 8d.) in the production of a ton of pig-iron. It is hoped that 368 tons of pig-iron can be produced per H.P. per annum.—*Board of Trade Journal.*

Our American Contemporaries.—Our American exchange, the *Electrical Review and Western Electrician*, has purchased *Electrocraft*, a brightly-written electrical contractors' paper, from which we have frequently quoted in our pages. The *Review*, in announcing this fact, says that it recognises in making the purchase, that "development and advancement along commercial lines are the most striking characteristics of the present electrical era."

THE DOCTRINE OF ULTRA VIRES.

[BY OUR LEGAL CONTRIBUTOR.]

WE have had occasion more than once to refer to what is known as the doctrine of *ultra vires* in relation to electric lighting companies. As companies are always wishing to know whether a particular course of conduct is open to them we make no apology for reopening the subject. The supply of electricity for lighting purposes has fallen so much into the hands of local authorities that most of the cases which come before the courts in connection with the subject have reference to the rights and duties of municipal and other such bodies. Nevertheless, it is sometimes necessary to consider the rights and powers of electric lighting companies in relation to the supply of electricity. It is proposed in the present article to consider some of these questions, and to dwell more particularly upon what is known as the doctrine of *ultra vires* in relation thereto.

It is provided by Sec. 4 of the Electric Lighting Act, 1882, that the Board of Trade may from time to time by provisional order authorise any local authority, company, or person to supply electricity. The expression "company" is defined by Sec. 32 of the same Act to mean "any body of persons corporate or incorporate."

That a company may in certain circumstances obtain power to supply electricity is clear enough; therefore, the question is: What are the powers of a company not specially floated or promoted for the purpose?

As a general rule, an electric lighting company which has been floated with the object of supplying electricity, has special powers conferred by the memorandum and articles of association. Power is thus conferred upon the company "to carry on at—and elsewhere in the county of——the business of an electric lighting company in all its branches, and in particular to construct, lay down, establish, fix and carry out all necessary cables, wires, lines, accumulators, lamps and works, and to generate, accumulate and supply electricity, and to light cities, towns, streets, docks and markets, theatres, buildings and places both public and private," and "to carry on the business of electricians, mechanical engineers, suppliers of electricity for the purposes of light and heat, motive power or otherwise, and manufacturers of and dealers in all apparatus and things required for, or capable of being used in connection with, the generation, distribution, supply, accumulation and employment of electricity."

Assuming that no power is conferred upon a company by the articles to supply electricity, a shareholder has the right in an action on behalf of himself and all other shareholders, to restrain the company from supplying electricity, although every shareholder but himself be acquiescent; but he has no right to come for a winding-up order under the Companies' Act, which provides that a company may be wound up whenever the Court is of opinion that it is just and equitable that the company should be wound up (Irrigation Co. of France, 6 Ch. 176, 184). It will be seen, therefore, that if no power to supply electricity is conferred by the memorandum and articles, some steps must be taken by the company to obtain the necessary powers.

Amalgamation, too, is a matter which must generally be specially provided for. To borrow an analogy from another industry, it appears that in the case of Greenwich Pier Co. *v.* Thames Conservancy, 1905, 21 T.L.R. 669, it was held that an agreement between the Greenwich Pier Co. and a waterman's society for the abandonment of their pier by paying to them a part of the net profits of the company's pier, was *ultra vires* of the pier company.

By the Companies' Act it is provided that a company registered under the Companies' Act may by special resolution alter the provisions of its memorandum of association with respect to the objects of the company. One of the purposes for which such an application may be made is "to carry on some business or businesses which under existing circumstances may be conveniently or advantageously combined with the business of the company."

In no case, however, can any such alteration take effect until confirmed on petition by the Court which has jurisdiction to make an order for the winding up of the company. Debenture-holders are entitled to notice of the application, and creditors may, by leave, appear and object to it.

Many companies have availed themselves of this section with a view to acquiring power to supply electric light; and it is probably owing to the facility with which the new powers may be obtained that the question of *ultra vires* is seldom considered. Under the foregoing powers, applications have been made successfully to the Court to confirm special resolutions to enable a gas and water company to supply electricity, *e.g.*, Colombo Gas and Water Co., Ltd., *Journal of Gas Lighting*, July 20th, 1896; Rugely Gas Co., W.N. (1899) 127. A telephone company was allowed to alter its memorandum so as to supply electricity for other than telephonic purposes on condition of making a suitable change of name (in *re* Oriental Telephone Co., W.N. (1891), 153); and a tramway company obtained similar powers (Leamington and Warwick Tramways Co., ELECTRICAL REVIEW, July 18th, 1902, p. 100).

Coming now to the position of a statutory company, that is to say, a company empowered to supply something other than electricity—it appears that such a body may obtain Parliamentary power to supply electricity. Gas companies existing under statutory authority may obtain power from Parliament to make application for a provisional order under the Electric Lighting Acts to produce and supply electricity for public and private purposes. There are numerous instances of such power having been conferred upon companies and upon local authorities, and there is a clause to this effect in the Model Gas Bill. For an instance of a case in which a gas company applied for, and obtained, the necessary powers, reference may be made to the Walker and Wallsend Union Gas Act, 1899.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

AT Auburn, a small town in Eastern Ontario, the Electric Power Co. will shortly start up a new generating station with one 500-KW., three-phase, 60-cycle, 6,600-volt unit; two more will be ready in the course of a month, and space is available altogether for four units of this size. Water is the motive power.

At No. 5 dam, about 5 miles from Trenton, another generating station is being built, which will be ready early next summer. The plant in this station will comprise four 650-KW., three-phase, 60-cycle, 6,600-volt vertical shaft generators driven by vertical shaft water turbines. In each of the instances given above the current will be stepped up to 44,000 volts for transmission purposes.

Messrs. Smith, Kerry & Chace, of Toronto, are the consulting engineers for all the Electric Power Co.'s work, and an order has just been placed by them with Messrs. Escher, Wyss & Co., of Zurich, Switzerland, who have an office in Toronto, for two water turbines to develop 5,400 H.P. each under a head of 76 ft. at a speed of 240 R.P.M. These are to be installed at Healy Falls on the Trent River.

The same company is also supplying, under this contract, two oil pressure governors and two automatically-operated relief valves each capable of discharging 60 per cent. of the total amount of water. These valves are said to be the largest ever constructed. Several other Canadian contracts have also been recently secured by this firm, including one for the Western Canada Power Co., Vancouver, B.C. This last-named company is putting in at Stave Falls two water turbine sets, each having a capacity of 13,500 B.H.P. to be developed under a head of 110 ft. at a speed of 225 R.P.M. The turbines are of the double Francis type, enclosed in sheet-iron casing. Power is to be supplied to Vancouver at the beginning of next month.

The Telegraph Department of the Canadian Pacific Railway has lately been busy opening new branch telegraph offices in the West, where new towns are growing up so quickly. Two new wires have been run from Winnipeg to Calgary, and one new one from Calgary to Vancouver. The

distance from Winnipeg to Vancouver is some 1,200 miles as the crow flies, and, as the Rocky Mountains intervene, it is no easy task to give a reasonably efficient service under such climatic conditions as obtain in this country.

At Edmonton, in Alberta, the City Council will shortly consider a proposal to spend some $20,000 on street lighting, whereby it is hoped to double the present lighting.

A scheme to erect a large plant for the production of salt by a new electrolytic process has been proposed to the municipal authorities in Gooderich, Ontario.

The Ontario Power Co., at Niagara Falls, will before long have in operation two extra units, each of 24,000 H.P.

Municipal telephone systems at home have not been a great success, and one is reminded of this by a report that the telephone system owned by the Manitoba Government will show a loss for the present year of some $150,000. Private companies must, somehow, manage better than this.

On account of the importance of the subject, no apology is needed for again referring to the Hydro Electric Power Commission, of Ontario. Various officials of the Commission are a present investigating the power possibilities in the extreme western, eastern and northern portions of this province. No fewer than 28 municipalities will, on New Year's Day, vote as to whether they will take electric power from the Commission or not, and there is little doubt that the majority will do so.

The Commission buys the greater portion of the power distributed and sold by it from one of the large Niagara Power Companies, but in some instances power is bought from small private companies, and it is now stated that power is to be developed on the Maitland and Sangeen Rivers, where at least 15,000 H.P. is available; a transmission line will, however, be run to this district from Niagara, as in summer these rivers are almost dry. In this way power will be available all the year round, and at the same time the load factor at Niagara during the summer will be improved.

If the western lines be built one will run from Seaforth to Gooderich, Clinton, Bayfield, Hensall, Exeter, Zurich, Dashwood, Crediton, Leith, Brussels, Wingham, and Belgrave. The other will run from Guelph to Elora, Fergus, Arthur, Mount Forest, Harriston, Palmerston, Listowel, Durham, Shallow Lake, Owen Sound, Meaford, Thornbury, Wiarton, and Collingwood.

From these two trunk lines it is intended that branches shall be run to every town and village in the district, so that every farmer in the community will be in a position to have cheap power delivered at cost.

In the Trent Canal district all towns from Whitby to Cornwall will be served. More than 4,000 H.P. will be developed on this canal, and on the Ottawa River, at Chat's Falls, there is a possible development of at least 60,000 H.P.

It is estimated that about £1,000,000 will be needed for equipment for the vast scheme outlined above, and by means of it practically every town and village in the older parts of the province will have cheap power at its doors.

In order to give some idea of the cost of this power, it may be stated that it ranges, on a flat rate, from about £10 4s. per H.P.-year for 1 H.P., to £8 3s. per H.P.-year for anything over 100 H.P.

On a differential rate, the cost varies from about £3 1s. for a service charge per H.P.-year plus 1·75d. per unit for 1 H.P., to £2 9s. per H.P.-year for service charge plus 0·75d. per unit for anything over 100 H.P.

Besides these rates, there are special ones for "restricted-hour" and "restricted-season" use.

Discounts from 20 per cent. upwards are obtainable on the foregoing figures, according to the locality and the consequent cost of power.

The subject of rates for electric lighting and power is as far from reaching finality in Canada or the United States as it is at home. The writer has recently had occasion to investigate the systems of charging adopted by 35 distinct municipalities and electricity supply companies located in all parts of both these countries.

The most noticeable feature of these various systems was their utter lack of uniformity. Some undertakings are adopting flat rates in preference to meter rates, while in other instances the reverse is the case. Some favour a fixed meter rate, and some a sliding one, and instances are found of each of these being used with or without any or all of the following :—

Service charge,	fixed	(or sliding).
Minimum charge	,,	,,
Discounts	,,	,,
Meter rental	,,	,,

Fixed discounts are not considered, as these do not affect the question of rates. Some base these sliding meter rates on the total capacity of an installation, and others on the maximum demand, while the same remark applies to service and minimum charges both fixed and sliding.

Many of the companies have no definite schedule of rates at all for large power consumers, but treat each case on its merits. Evidently there is room for improvement in this matter, as many of the systems are quite bewildering, at first sight, even to one accustomed to the complications of various sliding charges, to say nothing of that even more disturbing item in alternating-current systems, the power factor.

Telephones for railway service have evidently come to stay on this side of the Atlantic, as in Canada and the States, during the last three years, according to a recent estimate which is said to be conservative, over 50,000 miles of railway have been equipped, and are now being operated by their means.

In many instances both the old telegraph and the new telephone systems are operated on the same wire without any alterations to the original equipment of the former. In one case, three telephone and eight telegraph messages are being sent simultaneously over two pairs of wires.

Lethbridge, Alberta, has just decided to order 10 street cars of the latest pattern, and a certain quantity of overhead equipment.

The City of Winnipeg will, before long, be in a position to supply electrical energy from its great power station at Point du Bois. The cost of this plant when completed will amount to about £450,000, and it will be capable of generating some 100,000 H.P. The Canadian Pacific Railway has already made a long-term contract for 500 H.P. with the Civic Power Commission, and is likely to be taking 18,000 H.P. in the near future.

In Western Ontario, flowing in a northerly direction into Lake Huron, is the Aux Sables River; though not very long, its volume is considerable, and at a place called Rocky Glen, where there is already a natural fall, from which power is taken, the London and Sarnia Radial Railway Co. proposes to build a huge dam, the top of which will be 80 ft. above the present water level.

Plans of this scheme have already been prepared by Toronto engineers, and these are to be submitted to the Middlesex County Council early in December. The level of the river will be affected for about 20 miles up stream, and at a point several miles above the dam a bridge, now 35 ft. above the water, will have to be raised 15 ft.

Some day, no doubt, peat will become a valuable source of power in certain parts of Canada. The present known area of bogs covers about 37,000 sq. miles, capable of yielding nearly 30 thousand million tons of air-dried peat, having a calorific value equal to rather more than that of half that weight of coal. The Canadian Government has for some time taken an active interest in this subject, special investigations having been made by a branch of the Department of Mines.

A section of peat bog, about 300 acres in extent, was acquired by the Government, and an experimental plant for the manufacture of peat established; besides this, information has been obtained from eight or nine European countries where peat is used, on the different methods of cutting, drying, and utilising it.

A number of attempts has been made in Canada already to manufacture peat, but so far they all, or nearly all, seem to have been failures financially. The Dominion Government, however, evidently consider that the question is one of great importance to the country, and should not be given up because of past disappointments.

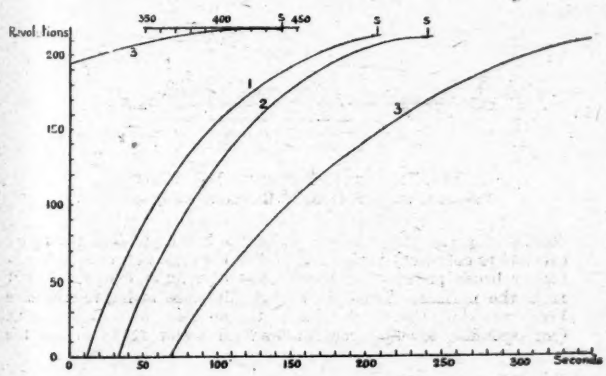
Perhaps the most promising method of using peat for the generation of power is in suction gas plants, as although its calorific value is low, its lower cost compared with coal, combined with the fact that a suction gas engine can utilise

a considerable percentage of the total energy of the fuel, should enable it to compete with coal. If, therefore, the Government's efforts at peat manufacture result in the establishment of the industry here on anything like a large scale, the cost of the fuel will be cheap, and locally, at any rate, its utilisation for power generation is almost sure to follow.

Coal in Canada is much dearer than in England, and although a good deal is mined in the east and west, the central provinces are practically without it. It has, therefore, to be imported from the United States, and statistics show that almost half of Canada's total coal consumption, amounting to about 16 million tons per annum at the present time, is purchased from America. A strike which occurred in the latter country caused very great inconvenience here some years ago. These are the main considerations which have led the Government of Canada to take up this subject.

FRICTION IN ELECTRICITY METERS: ITS DETERMINATION, COMPENSATION, AND RESULTANT ERRORS.

THE frictional resistance of the bearings, clockwork and collector gear is of the utmost importance in determining the accuracy of working of electric meters with rotating armatures. Hitherto the friction prevalent in a meter has been indicated by the starting current of the latter or some similar constant, but the following notes* show how the total frictional torque of meters may be separated into its component parts, and determined both absolutely and as a percentage of the driving torque of the meter.



(1) With clockwork and brushes; (2) Without clockwork, with brushes; (3) Without clockwork, without brushes.

FIG. 1.—RETARDATION CURVES, D.C. METER "A."

Lack of space prevents a complete account of the experimental methods employed, but the test most frequently carried out was a determination of the speed-time curve ($u = f(t)$) of the meter when "coasting" (*i.e.*, unexcited, and freed from the control of its damping magnets). Every time a mark on the braking disk of the meter passed a stationary index mark, a key was depressed to record the occurrence on the tape of a "double-writer" Morse set—the second circuit of which was connected to a seconds contact. Starting from the curve $u = f(t)$, and remembering that—

$$\frac{\text{Frictional torque}}{\text{Mt. inertia rotating parts}}\left(=\frac{D_R}{K}\right) = \text{angular retardation},$$

we have that $D_R = 2\pi K \cdot d^2u/dt^2 = f_1(du/dt)$, ... (1)

which gives a curve showing the friction as a function of the armature revs. per second (r/s).

Now it is possible, by an application of the well-known graphical method of tangents, to derive from the experimental curves $u = f(t)$ (fig. 1), velocity-time curves ($du/dt = f'(t)$, fig. 2), and thence the curves $D_R = f_1(du/dt)$ (see fig. 3); but to obtain good results by this procedure, the curves and tangents must be very accurately drawn, and the process is inevitably tedious. In most cases, however, the following approximate method of working fulfils all practical requirements:—

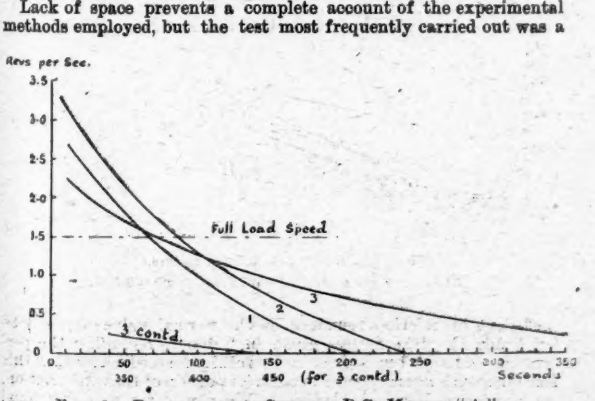


FIG. 2.—RETARDATION CURVES, D.C. METER "A."

* Abstracted from a very long and comprehensive article on the subject by Karl Schmiedel in the *Verhandlung des Vereins zur Beförderung des Gewerbfleisses.*

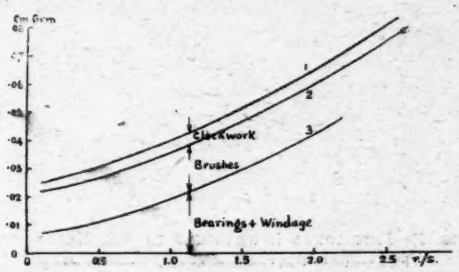


FIG. 3.

Referring to fig. 4—

$$u_b = f(t_b) = f(t_m + \Delta t/2)$$
$$u_a = f(t_a) = f(t_m - \Delta t/2) \quad \ldots \quad (2)$$

whence, by the application of Taylor's expansion, and taking (Δt) to be very small, we have—

$$f(t_m) = u_a + u_b$$

and $$f^1(t_m) = u_b - u_a/t_b - t_a = \Delta u/\Delta t \ldots \quad (3)$$

We now work, therefore, with chords instead of with tangents, thus obtaining more accurate results (in practice) by less laborious methods.

As an example, taken out of the complete tables of data from which curve 1 in fig. 1 is plotted—

For $t_m = 44{\cdot}9$ sec., and $\Delta u = 16$ revs.,

$\Delta t = t_b - t_a = 49{\cdot}1 - 40{\cdot}9 = 8{\cdot}2$ sec.

Hence $\Delta u/\Delta t = 1{\cdot}96$ r.p.s.

Repeating this process and plotting the results, we have the curves of fig. 2—

$$du/dt = f^1(t),$$

whence, the values of—

$$\frac{\Delta(du/dt)}{\Delta t} = d^2u/dt^2 \text{ (in limit)},$$

corresponding to various values of du/dt, may easily be calculated The values of D_R ($= -d^2u/dt^2 \cdot 2\pi K$) at once follow, and thence the curves of fig. 3, showing D_R as a function of du/dt.

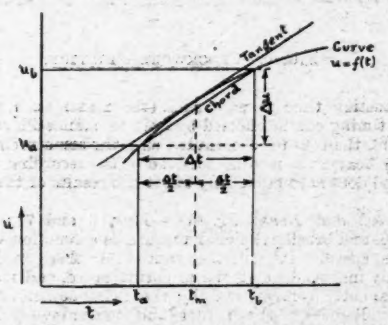


FIG. 4.

Determination of Moment of Inertia of Meter Armature.—A method is later explained whereby K may be determined by a retardation test (armature *in situ*), but wherever possible, the armature system should be removed from the meter and suspended by a wire about 2 m. long, so that it may oscillate about its axis. After determining the period of oscillation (τ_1) of the armature alone, a brass ring, of known moment of inertia K_R, is placed concentrically with the armature shaft on the braking disk. The new period (τ_2) of the system being noted—

$$K = K_R \cdot \frac{\tau_1^2}{\tau_2^2 - \tau_1^2} \quad \ldots \quad (4)$$

If the mt. inertia of the suspension clamp, &c., cannot be neglected, its period (τ_3) of oscillation should be noted; then—

$$K = K_B \cdot \frac{\tau_1^2 - \tau_3^2}{\tau_2^2 - \tau_1^2} \cdot \quad \ldots \quad \ldots \quad (5)$$

Experiments Conducted and Results Obtained.—Tests were carried out on eight alternating-current meters (including three-phase types) denoted hereafter by *a*, *b*, *c* . . . . *i*, and on six direct-current meters denoted by A, B, C . . . . G. The A.C. meters were all of the Ferraris pattern and of modern construction, while five of the D.C. meters were of the watt-hour Schuckert-Hummel

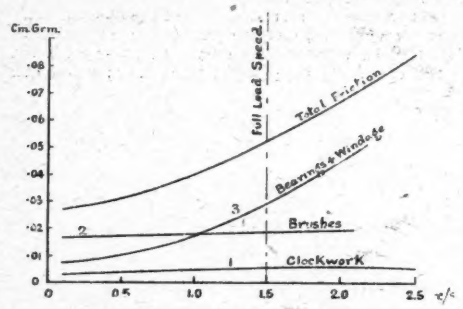


FIG. 5.—FRICTIONAL RESISTANCES IN D.C. METER "A." FULL-LOAD DRIVING TORQUE, 5·06 CM.-GRM.

type, the sixth being an ampere-hour meter. All the meters had vertical axes, and conformed to modern practice as regards gearing, bearings, brushes, &c. The assembly of the various parts and the disposition of the damping magnets are only of present importance, in so far as they affect windage friction.

The clockwork, brush and (bearings + windage) frictional torques were separated by carrying out retardation (or "coasting") tests :—

(*a*) With clockwork coupled and brushes on commutator.
(*b*) With brushes down, but clockwork uncoupled.
(*c*) With clockwork uncoupled and brushes raised.

Curves 1, 2 and 3 were thus respectively obtained in fig. 3 (for D.C. meter A), and, by subtracting ordinates—

Curve (1)—(2) gave the frictional torque due to clockwork alone.
" (2)—(3) " " " brushes alone.
While (3) " " " (bearings + windage) alone. (See curves 1, 2, 3 respectively, fig. 5.)

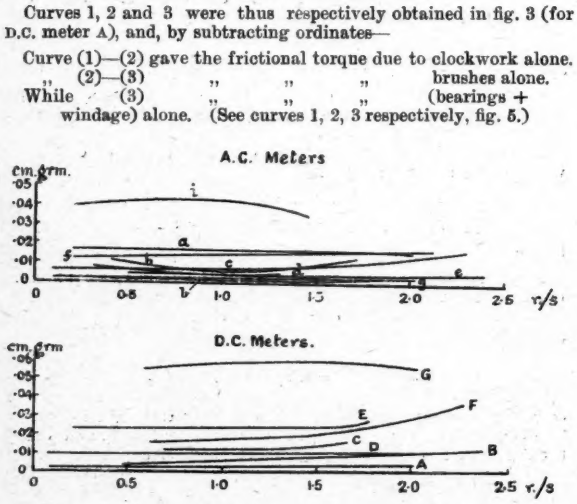


FIG. 6.—CLOCKWORK FRICTION.

The coasting time from 3 r.p.s. (the maximum speed at which accurate timing can be effected by eye), to standstill, seldom occupied more than 2 to 6 minutes, and the armature system being relatively heavy, the moving forward of the recording train during this period does not appreciably affect the results of the retardation test.

Clockwork and Brush Friction.—Figs. 6 and 7 represent the clockwork and brush frictional torques as a function of the meter armature speed. It will be seen that these resistances are practically independent of the armature speed, and may therefore be permanently compensated by the introduction of a constant torque.* Reducing the actual and percentage values of the clockwork and brush friction to an assumed armature speed of 1 rev. per sec., the extreme and mean values thereof are as shown in Table I.

The actual arrangement of the various recording trains did not vary greatly, and had no great influence on the results obtained. The care with which the parts were made and assembled, and the attention paid to the bearings, were proved to be of the utmost importance; thus, two direct-current meters of the same type, but varying in this respect, showed over 100 per cent. difference in clockwork friction.

Spur-gearing connection between the armature spindle and the recording train was found to give a higher mechanical efficiency than worm-gearing, speaking generally, but meter A, for instance, employed worm-gearing, yet showed a very low clockwork friction.

* See, however, later notes concerning the influence of the earth's field on this compensation in D.C. meters.

TABLE I.

		Brush friction (at 1 rev. per sec.)		Gearing (armature spindle to recording train).		Clockwork friction (at 1 rev. per sec.)		Coefficient of friction (brushes and commutator).	Brush friction (as % total friction) at full load speed.
		Absolute (cm. grm.)	Total friction (%)			Absolute (cm. grm.)	Total friction (%)		
Direct-current meters	Fm. to Mn.	0·0085	14	Worm	From	0·004	11	0·17	10
		0·025	42		to	0·060	54	0·30	34
		0·0182 (6)	24		Mean	0·022 (6)	24	0·238 (6)	21 (6)
				Spur	From	—	—		
					to	—	—		
					Mean	0·005 (1)	7		
Alternating-current meters		—	—	Worm	From	0·0055	15	—	—
		—	—		to	0·043	58	—	—
		—	—		Mean	0·0148 (7)	31	—	—
				Spur	From	0·0024	11		
					to	0·0032	14		
					Mean	0·0028 (2)	12½		

Bracketed numbers show from how many meters the averages are derived.

The values of the coefficient of brush friction—

$$\mu = \frac{\text{Torque due to brush friction (cm. grm.)}}{\text{Total brush pressure (grm.)} \times \text{collector radius (cm.)}},$$

were found to be practically independent of the composition and hardness of the metals employed, but the mechanical perfection of the brush construction and the dimensions of the collector were, of

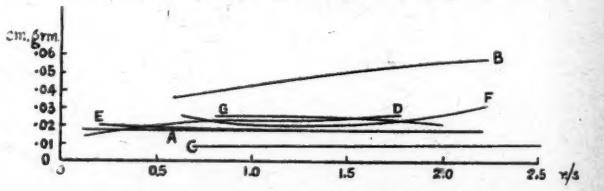
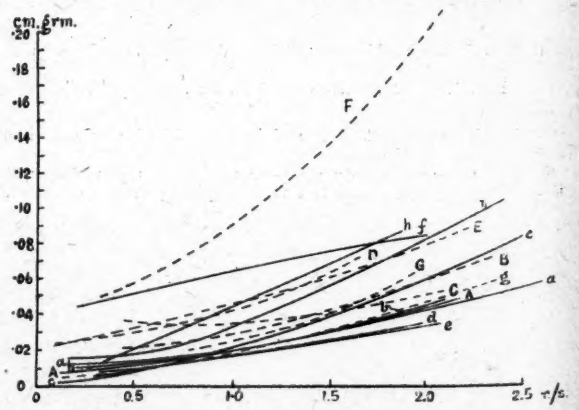


FIG. 7.—BRUSH FRICTION, D.C. METERS.
In case of meter B, brush friction accidentally excessive.

course, of great importance. The total brush pressure per meter (normal to collector) varied from 0·1 to 0·4 grm. but, even at much higher brush pressures, the coefficient of friction does not depart from the normal. Thus, in a particular case, owing to excessive brush pressure, the brush-friction torque rose to 0·042 cm. grm. (corresponding to 56 per cent. of the total meter friction) but the



a—i, A.C. meters; A—G., D.C. meters.
FIG. 8.—BEARINGS + WINDAGE FRICTION.

coefficient of friction remained at the normal value of $\mu = 0{\cdot}30$ (*cf.* Table I). The figures given in Table I, regarding the percentage value of brush friction at full-load speed, show that this resistance no longer represents the major portion of the total friction.

(Bearing + Windage) Friction.—We now come to a frictional resistance which varies considerably with the armature speed (*vide* fig. 8). In fact, the curves of the latter may be approximately represented by an equation of the form—

$$D_R = a + b\,(du/dt) + c\,(du/dt)^2, \quad \ldots \quad (6)$$

the average values of the coefficients *a*, *b*, *c* for the various meters tested being as shown in Table II.

The greater the relative magnitude of the constant term (*a*), the easier it becomes to compensate for bearing and windage friction by a constant auxiliary field. Should the coefficient *b* be

TABLE II.—VALUES OF COEFFICIENTS IN EQUATION (6).

		a	*b*	*c*
D.C. meters	From	0·0064	0·0000	0·0023
	to	0·0280	0·0426	0·0220
	Mean	0·0186 (7)	0·0153 (7)	0·0082 (7)
A.C. meters	From	0·0000	0·0053	− 0·0008
	to	0·0390	0·0470	+ 0·0105
	Mean	0·0083 (9)	0·0160 (9)	0·0040 (9)

Bracketed numbers show from how many meters the averages are derived.

large, the corresponding part of the friction can be allowed for by increasing the main current field, or by displacing the control magnets. The coefficient *c* may occasion considerable distortion of the calibration curve at high speeds (particularly in D.C. meters which have a small driving torque), and its value should therefore be as low as possible.

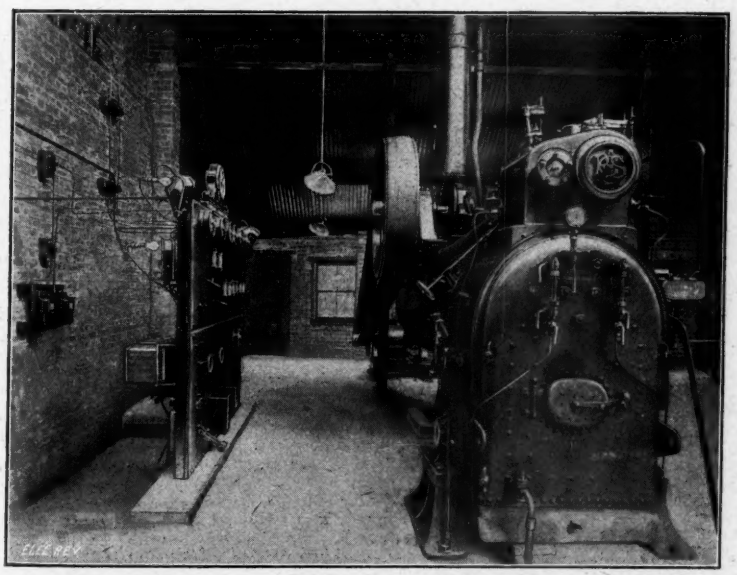
(To be concluded.)

ELECTRIC LIGHTING AT DAWLISH.

IN 1903 the Dawlish Council, in conjunction with Messrs. Crompton and Co., took out a provisional order for an electric light installation for public and private purposes. This order was, with a good many others, transferred to a company formed to operate several groups of towns in the kingdom, but it was found inexpedient to carry out the work at Dawlish.

In 1909 a proposal was made that a local company should be formed to take over the powers with the consent of the Board of Trade, by means of an amending order. This company was duly registered in the name of the Dawlish Electric Light and Power Co., with a board of local directors, and a local gentleman as secretary.

Dr. J. A. Purves, of Exeter, was appointed consulting engineer, and the contract was placed with Messrs. Crompton & Co. for the complete electrical installation, consisting of plant, overhead mains, &c., in accordance with the original arrangement come to with the Council.



DAWLISH ELECTRIC SUPPLY: SHOWING GARRETT SUPERHEATED STEAM ENGINE AND SWITCHBOARD.

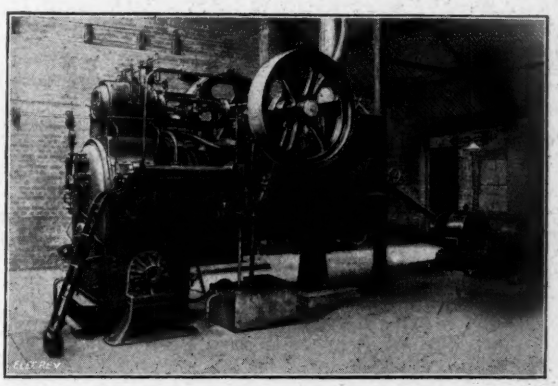
The plant is installed in a neat brick building, and a spacious engine room with a corrugated iron roof is provided, having ample room for an additional set to be added. A battery room is situated next to the engine room, and is provided with a tiled roof, special ventilating tiles being fitted at the peak. Leading out of the battery room is the engineer's office, while in the yard, coal bunkers and an ash store are provided, with a space for storing outside material.

The generating machinery installed in the engine room consists of a Garrett highly superheated semi-portable steam engine, which drives, by means of a belt, a Crompton dynamo-booster set. The rated output of this set is 25 KW. at 200/230 volts. The Garrett engine has proved to be exceedingly economical, and a recent test showed a fuel consumption of 2·36 lb. of coal per I.H.P.-hour.

The engine is of the single-cylinder, non-condensing type, and is consequently the most simple prime mover that it is possible to install. The steam distribution is effected by a balanced piston valve, and the cylinder and valve casing are jacketed with boiler steam.

The superheater is of particularly substantial construction, and so placed that it can be very readily kept clean and in no way interferes with the use of the tube brush for the boiler flue.

It should be noted that if the size of unit had warranted it, a



DAWLISH ELECTRIC SUPPLY: GARRETT-CROMPTON GENERATING PLANT.

Garrett compound condensing engine of the same type would have shown quite 50 per cent. greater economy in fuel.

The battery consists of 116 cells of the D.P. 17-plate type, having a capacity of 480 ampere-hours at the 10-hour rate.

The usual switchboard and meters are provided.

This installation is interesting from two points of view; the first is that overhead mains are used throughout, and bare copper is used in every possible position in the station for the connections between the battery and the switchboard, the only insulated cable used on the whole installation being that for coupling the dynamo booster set to the switchboard, where the connections have been made under the floor in pipes. The other novel point is in the use of the highly superheated steam engine, as this is the first installation giving a public electric supply where an engine of this type has been used, and in small electric light stations these engines should prove very economical and reliable.

The supply was commenced on June 26th, 1911, and some street lighting has already been undertaken.

Mr. C. C. Hodges, late of Dover, has been appointed engineer, and under his energetic management the number of private consumers is rapidly increasing.

NEW SYSTEM OF CONNECTING BUSINESS TELEPHONE LINES.

ON modern business telephone lines, the possibility of unlimited connections is of prime importance, yet must not be purchased by the sacrifice of secrecy of speech. It is imperative that a connection between two subscribers should not be prematurely broken or overheard by a third party. Various of the systems hitherto employed to enable a number of subscribers in one building to employ a limited number of main lines brought to a central distributing bureau have been subject to the grave disadvantage that a third person might be connected to a line already in use; such a state of affairs is quite unpermissible, and one of the most recently devised means for its avoidance is described below.

The selective calling of various subscribers is easily arranged by the use of alternating-current bells responding only to A.C. of a given frequency; each subscriber is given a definite frequency, and may thus be called without disturbing any other stations on the line. Various "blocking" devices have been arranged to secure secrecy of speech under such circumstances, but have usually involved considerable complications in the initial calling and connecting of the desired subscribers.

Probably the most difficult case in which to secure the above desiderata is that of a number of offices connected in parallel at

the end of a common line from a central battery exchange. In such a case, the subscribers can no longer be called directly; a selective "frequency current" first operates a relay at the connecting point of the branch desired. An auxiliary circuit is thus closed, and, by means of a switching battery, the desired subscribers are connected, to the exclusion of all others.

In the system illustrated diagrammatically in fig. 1 (described by M. R. Grossman in a recent issue of *Elektrotechnischer Anzeiger*), the exchange can call up any desired subscriber and connect him as requested without the use of long-distance auxiliary circuits or switching batteries and without the co-operation of the subscribers. Three stations are shown connected in parallel to the common line La, Lb from the central battery exchange. At G_1, G_2, G_3 the terminals a, b are the points of connection of the local circuits and E_1, E_2, E_3 represent the switching relays at the three stations. The relay magnet windings are shunted by condensers C to provide a path for the speech currents and their excitation is controlled by special keys as shown.

PA is a polarised switching relay, so constructed as to be very sensitive to direct currents while ignoring the A.C. flow. Its electromagnet is again shunted by a condenser, and again controls

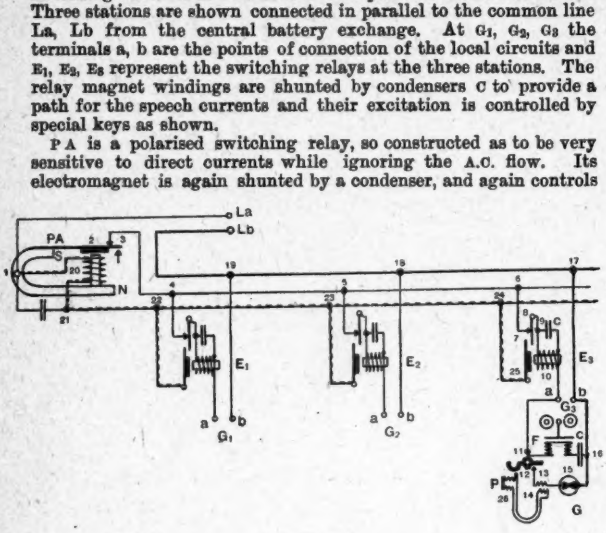


FIG. 1.

a Morse contact. Attraction of the armature 2 opens the local common calling and switching branch circuit. Referring to the diagrammatic view of a complete subscriber's circuit, F is an A.C. bell (D.C. flow through which is prevented by C); 12 is the switch hook; 14 is the transformer; 15 the microphone and T the receiver.

If the subscriber at G3 calls up the exchange by lifting his receiver, the central battery current follows path A, viz.:—La, 1, 2; 3, 4, 5, 6, 7; 8, 9, 10, G3a, 11, 12; 13, 14, 15, 16, G3b, 17, 18, 19, Lb. Magnet 10 then attracts armature 25, so closing the contacts 8, 25, and opening 7, 8. In consequence of this change, the current now flows *via* path B:—La, 1, 20, 21, 22, 23, 24, 25; 8, 9, 10, G3a, 11, 12; 13, 14, 15, 16, G3b, 17, 18, 19, Lb. The strength and direction of the current exciting magnet 20 is such that the contact 2, 3 is opened, and thus the common call and switching line 3, 4, 5, 6 is disconnected, and switching current is cut off from the other stations on the branch line. Other subscribers cannot destroy or overhear the existing connection.

To call up a given subscriber, the exchange sends a selective A.C. of the requisite frequency through the circuit La, Lb. This calling current takes path C:—La 1, 2, 3, and from 4, 5 and 6 through F and C in all the stations in parallel to 17, 18, 19 Lb. The only bell F which rings is the one set to the frequency of the calling current; the subscriber at this station lifts his receiver and his connection is then completed according to the process A, B above.

Should two of the branch stations desire to intercommunicate, the exchange temporarily reverses the polarity of the central battery connections to the terminals La, Lb. After the second subscriber has answered the call, the exchange reverses the central battery current, and the two stations remain in connection without possibility of interruption or overhearing by a third party (the switching-in relays are more sluggish than the switching-out relay, hence the connection of the subscribers is not disturbed during the second reversal of the central battery current).

ELECTRIC LIGHTING COMPANIES AND THE SALE OF FITTINGS.

[BY OUR LEGAL CONTRIBUTOR.]

AMONG the legal conundrums offered for solution in "Our Legal Query Column," those which relate to the right of undertakers to deal in electrical fittings are of very frequent occurrence. Such dealing is looked upon, naturally, with considerable jealousy by the private trader. The company or local authority supplying electricity is in "on the ground floor" with the consumer. The man who attends periodically to register the meter record has unrivalled opportunities for pushing the wares of those who employ him; while, if the undertakers are a local authority, they have the security of the rates to back their quasi-commercial enterprises.

What powers, then, are usually vested in local authorities to enable them to erect an installation on the consumer's premises and supply him with miscellaneous fittings?

The general powers of electricity authorities are defined and delimited by Sec. 10 of the Electric Lighting Act, 1882, which provides that: The undertakers may, subject to and in accordance with the provisions and restrictions of this Act, and of any rules made by the Board of Trade in pursuance of this Act, and of any licence or order, or special Act authorising or affecting their undertaking, and for the purpose of supplying electricity, acquire such lands by agreement, construct such works, acquire such licences for the use of any patented or protected processes, inventions, machinery, apparatus, methods, materials or other things, enter into such contracts, and generally do all such acts and things as may be necessary and incidental to such supply.

Attempts have been made so to construe this section as to make it extend to the supply of electrical fittings. In the case of the Attorney-General *v.* Corporation of Leicester (1910) 26 T.L.R. 568, which may be regarded as the leading case on the subject, the plaintiff alleged that the defendants, purporting to act in pursuance of their statutory powers, had (to use the cumbrous legal phraseology of the lawyer) "carried on and were still carrying on the trade or business of providing, selling, supplying, erecting, installing, altering and repairing electric light cables, wires, fittings, electric bells and motors for working various machines in connection with houses and buildings, both within and outside their area; and that the defendants had no power under the said Acts or Order to carry on such a trade or business." The plaintiff, therefore, claimed a declaration to that effect, and an injunction to restrain the defendants from carrying on such trade or business.

To this the defendants boldly replied that power to sell and erect fittings was conferred on them by the section above mentioned.

It appeared that the defendants had showrooms in one of the principal streets of Leicester, with windows fronting the street, in which were exhibited for sale all kinds of electrical fittings and appliances—lamps, shades, radiators, wiring, &c.—suitable for use by consumers of electricity, and that the defendants had been selling and supplying such fittings both inside and outside the borough to consumers, some of whom took their supply of electricity from the defendants, and some of whom had their own installations and generated their own electricity.

It was contended on the part of the defendants that "the supply of" electricity did not cease at the consumer's terminals, but continued to the lamps on the consumer's premises. Mr. Justice Neville, who heard the case, came to the conclusion that the argument of the defendants was unsound. Pressed to its logical conclusion, it came to this—that if the duty to supply extended to the fittings in a house, the undertakers might have to bear a serious burden. To use his own words:—

"By Clause 21 of the Provisional Order, however, they are bound to give a supply of energy on demand, and if the wiring of the house and provision of fittings is part of the supply, they would be compellable to do it without remuneration, and I think there is force in the plaintiff's argument that this cannot have been intended by the legislature. In my opinion, 'supply,' within the meaning of the Act and Order is completed at the consumer's terminals. The installation of electricity and provision of fittings is, in my opinion, a separate business incidental to the use but not to the supply of energy. I think that the defendants have misinterpreted their powers and have been carrying on a business in excess of them. In my opinion the Electric Lighting Act of 1909 does not throw light upon the meaning of 'supply' in the Act of 1882, Sec. 16 in the Act of 1909, not having, in my opinion, reference to any power given by the Act of 1882. I think the plaintiff is entitled to the declaration and injunction asked for, and that the defendants must pay the costs of the action."

Having regard to this decision, any local authority or company seeking to supply and erect fittings must do so by virtue of some authority other than the Act of 1882.

When the Electric Lighting Act, 1909, was under consideration in Parliament, an attempt was made to introduce a clause conferring a general right to supply fittings, but the clause disappeared from the Bill before it became an Act of Parliament. If a company supplies fittings it generally does so under the following clause (which will be found in Knowles's "Law Relating to Electricity," Vol. I, p. 310):—

1. The company may purchase, sell, let for hire, or otherwise deal in, fix, repair, and remove, but shall not manufacture dynamos, motors, accumulators, meters, burners, stoves, lamps, fittings, wires, plant, engines, conductors, machinery, appliances, and other apparatus for or in relation to the production, supply, distribution or utilisation of electrical energy and may provide all materials and do all work necessary or proper in that behalf and may make such reasonable charges therefor as they may think fit.

2. Apparatus let for hire under the provisions of this section shall not be subject to distress or to the landlord's remedy for rent or be liable to be taken in execution under any process of any court or any proceedings in bankruptcy against the persons in whose possession the same may be. Provided that such apparatus has upon it a distinguishing metal plate affixed to a conspicuous part thereof or a distinguishing brand or other mark conspicuously impressed thereon sufficiently indicating the company as the actual owners thereof.

Having such powers, it is clear that the company could compete with all the electricians in the neighbourhood. The proviso at the end of the second paragraph is inserted in order to enable the company to avail itself of the provisions of Sec. 16 of the Electric Lighting Act, 1909, the purpose of which is to protect undertakers who let fixtures on hire. In law there is a principle by which every fixture attached to the wall of a house becomes part of the

freehold; by virtue of the maxim *quicquid solo plantatur, solo cedit*, a fixture becomes the property of the landlord, and cannot be removed by the tenant, or by any person from whom the tenant has hired it.

In the case of a local authority supplying electricity, the "fittings supply clause" is generally somewhat more elaborate. It usually provides that (according to the authority above quoted, page 319):—

The Corporation may provide, let for hire, and fix, repair and remove, but shall not manufacture lamps, meters, electric lines, fuses, switches, fittings, lampholders, motors, and other fittings for lighting and motive power, and for all other purposes for which electrical energy can, or may, be used, and may provide all materials and work necessary or proper in that behalf, and with respect thereto may demand and take such remuneration as, or rents and charges, and make such terms and conditions as may be agreed upon.

2. Any fittings let for hire under the provisions of this section shall not be subject to distress or to the landlord's remedy for rent, or liable to be taken in execution under process of law or proceedings in bankruptcy against the person in whose possession the same may be; provided that such fittings are marked or impressed with a sufficient mark or brand indicating the Corporation as the actual owners thereof.

3. Provided as follows:—(*a*) It shall not be lawful for the Corporation to expend money (except through a contractor) upon the provision of such fittings, or of labour and materials required, for the fitting, repairing or removal thereof, upon or from the premises of their consumers or prospective consumers.

(*b*) The Corporation shall so adjust the charges to be made by them for any such fittings, or for the fixing, repairing or removal thereof, as to meet any expenditure by them under the powers of this section in connection therewith (including interest upon moneys borrowed for those purposes, and all sums applied to sinking fund for repayment of moneys so borrowed).

(*c*) Every sum charged by the Corporation to a consumer in respect of the provision of such fittings, or the fixing, repair or removal thereof shall be separately stated on every demand note delivered by the Corporation to the consumer.

(*d*) The total sums received and expended by the Corporation in connection with the purposes in this section mentioned in each year (including interest and sinking fund) shall be separately shown in the published accounts of the electricity undertaking of the Corporation for that year.

A question may arise on the above clauses as to how far it will be necessary to mark each fitting with a sufficient mark or brand. It would manifestly be impossible to mark every lamp, switch, point, bracket and piece of wire with a brand indicating the name of its true owner. It is conceived that a plate fixed at or near the meter giving a brief and practical schedule of all the parts which belong to the company will meet the case.

No person about to levy a distress could then justify the seizure of any fitting which was enumerated in the schedule.

It follows from what has been said that he who would question the right of a company or local authority to supply fittings must take care to examine the terms of the provisional order under which the powers are exercised.

LEGAL.

The National Telephone Co., Ltd.

On Friday, December 15th, an action by Lord Avebury against the National Telephone Co., Ltd., was mentioned to Mr. Justice Joyce in the Chancery Division.

Mr. Younger, K.C. (for plaintiffs), said he had a motion in the matter, but he proposed to save it and take liberty to amend his notice of motion and the writ. It was a very important question, although a very short one. It turned upon the construction of the debenture trust deed and of an agreement entered into between the company and the Postmaster-General.

His Lordship gave leave to amend.

The matter was again mentioned before his Lordship on Wednesday.

Mr. Younger, K.C., counsel for plaintiffs, said his Lordship would remember that the action was brought by Lord Avebury and Lord Wolverhampton, trustees of two issues of debenture stock in the National Telephone Co., with the object of obtaining the decision of the Court as to whether the debentures were redeemable with a premium of 3 per cent. The point was whether the debenture-holders were entitled not only to the return of their principal with interest, but whether they were entitled also to this premium of 3 per cent. That would depend upon the true construction of the agreement, upon which there were two or three issues. Both the plaintiffs and defendants were agreed that the question was one of serious importance, and one which his Lordship would desire time to consider, but as the agreement for the sale of the company's undertaking to the Postmaster-General by the 31st of the present month, the parties had thought it necessary that some determination should be arrived at before that time arrived. They had, however, come to an arrangement which it was thought would allow of the matter going over until next sittings. It had been agreed that the defendants should set aside a sum of £50,000, which was the amount that was in dispute between the plaintiffs and defendants, out of the proceeds of sale received from the Postmaster-General and upon the company undertaking to do that the interlocutory motion should stand over until the trial of the action. They also asked, subject to his Lordship's approval, that they should be allowed to set the action down for trial now without pleadings with liberty to apply at the earliest possible day next sittings to get a speedy trial.

Mr. Hughes, K.C., for the company, said it seemed to him that the course proposed was a reasonable one. They desired to give every possible protection to the debenture-holders. They only desired to do what was right.

Mr. Younger said that on behalf of the trustees he desired to say that they did not desire in any way to hamper the company in carrying the sale through.

His Lordship said that on the undertaking which would be signed by junior counsel, he would make no order except to give leave to set the action down for trial without pleadings, and the parties might apply to him on the first day of next sittings to fix a day for the hearing. Possibly it might be arranged for Monday, January 15th.

Sunderland Forge and Engineering Co. *v.* The Antrim Ore Co. of Newcastle.

This case was heard by Mr. Justice Bray, sitting to deal with commercial causes in the King's Bench Division, on Friday, December 15th. Plaintiffs claimed damages from the defendants for damages to plaintiffs' dynamo plant sent from Newcastle to Belfast on December 21st, 1910. Defendants denied either negligence or liability.

Mr. Geo. Wallace, K.C., for the plaintiffs, said the parties were in the habit of doing business with one another, and on December 21st, 1910, the plaintiffs sent three dynamos from Sunderland to defendants' wharf at Newcastle, for carriage to Belfast by defendants' ss. *Glendun*. The ship was loaded with pig-iron, and there was no room for the plaintiffs' goods except on deck. The captain thereupon saw Mr. Thompson, the defendants' agent, who decided to take the risk without consulting plaintiffs. Upon the voyage it blew a gale, and the covering upon the machinery was burst open, and the plant was seriously damaged by water. Defendants pleaded that the plaintiffs were bound by the conditions on the invoices, but that could not be, and the only question would be as to the liability of the defendants as the amount of damage it was arranged should be subsequently ascertained. It was obviously improper that goods of this kind should be packed on a deck and thus exposed to the risk of damage by bad weather.

Mr. Marr, one of plaintiffs' directors, said he never read the conditions on the invoices, and did not agree with them.

Mr. Bailhache, K.C., argued the case for the defendants, but called no evidence.

His Lordship, in giving judgment, said the only evidence he had in addition to that of Mr. Marr, was that of documents. Invoices were delivered which bore certain conditions on them, but he found it was true, as Mr. Marr said, that he never agreed to be bound by them. He had no evidence to show that plaintiffs misled the defendants as to the nature of the machinery, but he thought it was complicated machinery which anyone would know was dangerous to pack on deck. The captain thought this, as he consulted Mr. Thompson, defendants' agent, who evidently decided to risk it. He did not think Mr. Thompson thought that plaintiffs had agreed that the goods should be carried on deck. Everyone knew that there was more risk in carrying goods on deck than in the holds, and that insurances which covered goods in the holds would not cover them when on deck. He found that plaintiffs never agreed to be bound by the conditions, and there was no evidence that Mr. Thompson was not the agent of the defendant company. There would, therefore, be judgment for the plaintiffs, the amount to be agreed between the parties.

Tram Accident Claim.

In the King's Bench Division, on Tuesday, before Mr. Justice Lush and a common jury, Mrs. Elizabeth Sales claimed damages from the Metropolitan Electric Tramways Co., Ltd., for injuries received while alighting from one of defendant company's trams near Harrow Road, in May last. She complained that the driver negligently started the car before she had properly alighted. Defendants denied negligence. Having heard witnesses on both sides, the Court returned a verdict for the defendants.

Fatalities.—A correspondent writes:—"A shocking fatality occurred on the 13th inst. at Sir John Robinson's Worksop Manor Estate. A girl named Edith May Cutts, daughter of Albert Cutts, a joiner employed on the Estate, took her father's dinner up to the Manor, and while at the workshop her dress was caught in the shafting of an electric motor, which whirled her round and round, and she was cut to pieces."

Alex. McDonald, assistant electrician, was found dead at the foot of a ladder, from which he had fallen, in the sub-station at East Wemyss of the Fife Electrical Power and Light Co.

"Davis" Challenge Cup.—Round 1.—From the G.E.C. Athletic Club we learn that the results of the matches played on Saturday last, the 16th inst., for the above Cup, were as under:—G.E.C. 9 *v.* Edmundsons, 0; St. James' 6 *v.* Drake and Gorham, 4; Anti-Attrician 0 *v.* Ediswan, 9; Siemens 2 *v.* Electrical Installations, 2.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

AMENDMENTS.

AUSTRALIAN COMMONWEALTH.—The Government of Australia have recently formulated certain tariff amendments which were to come into force on December 1st. The following are the amendments affecting electrical and similar goods :—

The heading "Electrical Machines and Appliances and Parts thereof" has been changed, and the words "and parts thereof" have been eliminated. The parts will now presumably be dutiable separately according to class.

The heading "Generators for direct coupling to steam turbines" has been eliminated. These were formerly free of duty, but they will now presumably be dutiable as other generators—*i.e.*, as dynamo-electric machines, as follows :

Up to 200-H.P. capacity	...	20 % ad val.
Over "	" ...	12½ % "

The duty on "electroliers" has been raised from 20 % to 25 % ad val.

The duty on "arc lamp carbons" of foreign origin has been raised from 5 % to 10 % ad val., whereas British goods continue free of duty.

"French chalk preparations and steatite" have been made dutiable at the rate of 25 % ad val.

The duty on "asphalt tiles" of foreign origin has been raised from 15 % to 20 %, whereas British tiles remain dutiable at the rate of 15 %.

N.B.—The duties quoted above are in all cases those under the British Preferential Tariff, except when otherwise stated.

PORTUGAL.—The Portuguese Government have decided that posts or poles of wood suitable for use as supports of electric wires, impregnated or not, simply barked, without further working and without accessories, are to be dutiable at the rate of 3 % ad val.

The Portuguese Government have also issued a decree fixing the tariff of fees payable for the visa by Portuguese Consuls of declarations of cargo (*deçlaraçao de carga*) consigned to Portugal by sea.

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

27,121. "Firing cartridges electrically in small arms." SOC. PEUBLE ET DURIF and G. PEUBLE. December 1st.

27,150. "Sparking plugs." G. NAGEL. (Convention date, December 6th, 1910, Germany.) December 4th. (Complete.)

27,155. "Electric inspection lamps for use on automobiles." W. PETO and PETO & RADFORD, LTD. December 4th. (Complete.)

27,163. "Automatic electric fire extinguishers." S. B. PRIEST. December 4th. (Complete.)

27,189. "Electric resistances and apparatus for the manufacture thereof." J. A. HIRST and P. S. BROOK. December 5th.

27,192. "Miners or the like electric safety lamps." I. FAWCETT. December 5th.

27,212. "Commutation of direct-current dynamo-electric machines." SIEMENS BROS. DYNAMO WORKS, LTD. (Siemens Schuckertwerke G.m.b.H., Germany.) December 5th. (Complete.)

27,227. "Methods of applying, and apparatus for, the production of intermittent X-rays for the treatment of deep-seated parts." K. SCHALL. December 5th. (Complete.)

27,254. "Electric switches." J. H. WHYMAN. December 5th.

27,260. "Process of reducing tungsten oxides." J. PINTSCH AKT.-GES. (Convention date, November 7th, 1911, Germany.) December 5th. (Complete.)

27,261. "Incandescent filaments for electric incandescent lamps." J. PINTSCH AKT.-GES. (Convention date, November 17th, 1911, Germany.) December 5th. (Complete.)

27,262. "Method of sharpening thin wires." J. PINTSCH AKT.-GES. (Convention date, November 20th, 1911, Germany.) December 5th. (Complete.)

27,263. "Incandescent electric lamps." G. LUDECKE and BRIMSDOWN LAMP WORKS, LTD. December 5th. (Complete.)

27,290. "Manufacture of metal-filaments for electric lamps." E. R. GROTE. December 5th.

27,291. "Electric clock." C. VOGT. December 5th. (Complete.)

27,360. "Tungsten wire especially suitable for use as incandescence body or filament for incandescent electric lamps." O. KRAUSE. (Convention date, March 2nd, 1911, Germany.) December 6th. (Complete.)

27,366. "Apparatus for sterilising fluids by means of rays of short wave length." R. RENONCE. (Convention date, December 6th, 1910.) December 6th. (Complete.)

27,377. "Method of manufacturing electric steel castings." G. FISCHER and B. SCHUDEL. (Convention date, December 7th, 1910, Germany.) December 6th. (Complete.)

27,386. "Electric brakes for tramway and like vehicles." P. S. TURNER. December 6th.

27,388. "Incandescent electric lamps." R. JAHODA and ELEKTRISCHE GLUHLAMPEN FABRIK "WATT" SCHARF LOTI & LATZKO. December 6th. (Complete.)

27,392. "Portable electric lamps applicable for use in mines and elsewhere." R. RUMNEY and H. HUNTE. December 6th.

27,399. "Matrices for electrotypes." F. F. PERSHKE, E. H. RUDD and W. MATTHEWS. December 6th.

27,400. "Production of high-grade steel and slag rich in soluble phosphates in an open hearth or electric furnace." DEUTSCHE LUXEMBURGISCHE BERGWERKS-UND HUTTEN AKT-GES. (Addition to 19,640, 1911.) December 6th. (Complete.)

27,433. "Electrically-operated mechanism for reversing and accelerating the movements of the tables of planing machines." W. R. DELL & SON, LTD., and G. RICHARDS, trading as High Speed Planer Reconstruction Co., and R. Stewart. December 7th.

27,474. "Method and apparatus for the electric transmission of pictures." L. TSCHORNER. (Convention date, February 11th, 1911, Austria.) December 7th. (Complete.)

27,482. "Lighting motor-driven vehicles by electricity." H. LEITNER. December 7th.

27,483. "Metal-filament lamps and a method of manufacturing same." EHRICH & GRAETZ. (Convention date, July 18th, 1911, Germany.) December 7th. (Complete.)

27,510. "Telegraphic system." P. FAIELLA. (Addition to 4920/1911. Convention date, December 9th, 1910, Italy.) December 7th. (Complete.)

27,536. "Automatic electrically-actuated taximeters for cabs and like vehicles." C. ROBINSON. December 8th.

27,542. "Portable electric accumulators and charging apparatus. K. R. SMITH. December 8th.

27,550. "Thermo-electric generators." P. FERRA. December 8th.

27,560. "Means for and methods of localising and clearing faults in alternating-current high-tension systems." A. M. TAYLOR. (Addition to 27312/1910.) December 8th.

27,568. "Bracket spindles for use on telegraph, telephone or other wire supports." F. J. S. BAKER. December 8th.

27,620. "Electrodes." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) December 8th.

27,635. "Incandescent electric lamp." W. F. MELHUISH. December 9th.

27,669. "Arc lamps." KORTING & MATHIESEN AKT-GES. December 9th.

27,686. "Vapour current rectifying devices." F. CONRAD. (Convention date, December 10th, 1910, United States.) December 9th. (Complete.)

27,697. "Electric apparatus for keeping and preservating the persons or things against breakings, robberies and other criminal attacks." A. RICHON. December 9th. (Complete.)

27,699. "Means for guiding the electrodes of electric arc lamps." SIEMENS-SCHUCKERTWERKE G.m.b.H. (Convention date, December 10th, 1910, Germany.) December 9th. (Complete.)

27,708. "Flexible pipe connectors for electrical purposes and the like." H. R. DOEL. December 9th.

27,729. "Electric maximum and minimum excess voltage switches." E. EISEMANN and E. EISEMANN & Co. G.m.b.H. December 9th. (Complete.)

27,730. "Electric generators for motor-driven vehicles." E. EISEMANN and E. EISEMANN & Co. G.m.b.H. December 9th. (Complete.)

27,734. "Electromagnetically-operated switch and like arrangements." BRITISH ELECTRIC TRANSFORMER CO., LTD., and W. MCWILLIAM. December 9th.

27,735. "Apparatus for use in the distribution of alternating currents." BRITISH ELECTRIC TRANSFORMER CO., LTD., and A. F. BERRY. December 9th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford ; price, post free, 9d. (in stamps).

1910.

MACHINES FOR WINDING ARMATURES OF DYNAMO-ELECTRIC MACHINES, AND FOR ANALOGOUS PURPOSES. B. Brooks and F. H. Alston. 26,225. November 11th.

METHODS OF AND MEANS FOR OBTAINING ALTERNATING CURRENTS FROM CONTINUOUS-CURRENT CIRCUITS, AND VICE VERSA. A. M. Taylor. 26,390. November 14th. (Addition to No. 20,867 of 1909.)

DYNAMOS. E. R. Freeman. 26,393. November 14th.

DEVICES FOR CONTROLLING THE SPEED OF ELECTRIC MOTORS. Adams Manfg. Co. (Cutler-Hammer Manfg. Co.) 26,420. November 14th. (Addition to No. 13,406 of 1910.)

ELECTRICAL WELDING MACHINES. British Insulated and Helsby Cables, Ltd., and P. Bucher. 26,478. November 15th.

ELECTRIC CURRENT CONTROLLING DEVICES OR SWITCHES. W. K. L. Dickson. 26,627. November 16th.

ELECTRIC REGULATORS AND THE LIKE. H. Leitner. 27,037. November 21st.

THERMALLY-ACTUATED ELECTRIC SWITCH. W. K. L. Dickson. 27,277. November 23rd.

ELECTRICAL APPARATUS FOR THE HEATING OR ELECTROLYSIS OF LIQUIDS. R. von Brockdorff. 27,562. November 26th.

ELECTRIC APPARATUS FOR GAS LIGHTING AND EXTINGUISHING PURPOSES. T. F. Canning. 27,986. December 1st.

FUSE-BOXES FOR CONTROLLING ELECTRIC CIRCUITS. V. Hope. 29,631. December 21st.

ELECTRIC CLOCKS. H. B. Swift and W. D. Baxter. 29,747. December 22nd.

AUTOMATIC ELECTRIC ILLUMINATED AND TIMED ADVERTISING CABINET. J. J. Tanner. 30,176. December 29th.

1911.

LAMP GLOBES, PARTICULARLY FOR ELECTRIC ARC LAMPS. Johnson & Phillips, Ltd., and J. Brockie. 402. January 6th.

ELECTROSTATIC OR INFLUENCE MACHINES. E. A. Watson and Morris & Lister, Ltd. 1,036. January 14th.

RHEOSTATS OR THE LIKE. R. Walker. 3,510. February 11th.

ELECTRIC BELL-PUSHES. W. Bonnet. 3,514. February 11th.

SPARK PLUG. L. Podszus. 3,821. February 15th. (October 8th, 1910. Addition to No. 7,617 of 1910.)

MAGNETO-ELECTRIC IGNITION APPARATUS FOR EXPLOSION ENGINES. Mea Fabrik Magnet Elektrischer Apparate Ges. 4,085. February 17th. (February 17th, 1910.)

CONTROL OF ELECTRIC MOTORS. British Thomson-Houston Co. (Allgemeine Elektricitäts Ges.) 5,289. March 2nd.

VACUUM DISCHARGE TUBES FOR LIGHTING PURPOSES. M. Claude. 5,589. March 6th. (March 7th, 1910.)

APPARATUS FOR STERILISING LIQUIDS BY MEANS OF THE ULTRA-VIOLET RAYS. F. Triquet. 9,047. April 7th.

CONTINUOUS ELECTRIC PHOTOGRAPHIC PRINTING OR COPYING MACHINES. J. Halden & Co. and H. R. Watts. 10,702. May 2nd.

SIGNALLING DEVICES FOR TELEPHONE SYSTEMS. A. J. Dunton. 12,898. May 19th.

ELECTRIC CONDUCTORS MORE ESPECIALLY SUITABLE FOR USE AS INCANDESCING BODIES FOR ELECTRIC LAMPS, FURNACES AND THE LIKE. British Thomson-Houston Co. (General Electric Co.) 13,021. May 30th.

TELEPHONE MOUTHPIECES. N. Steinberger. 14,591. June 22nd. (August 20th, 1910.)